MAY, 1960

Plant Engineering

IN THIS ISSUE

Pre-planning for
Industrial Emergencies and Disasters 112
Effective Communication Gets Work Done Fast 117
In-Place Acid Cleaning—
Sulfamic Is Quick, Effective and Cheap 118
Are Building Costs Really High? 123
Work Order System Gives "At-a-Glance" Information ... 126
Lawn Soakers Take to the Roof 128
Check Industrial Drawings for Safety 130
"Doughnut" Tunnels—Aid to Maintenance 134
Year-Round Air Conditioning—
Eight Units Share the Load 136
Hot and Cold Tables Speed Honeycomb Milling 138
Corrosion Troubles?
Can Wrought Iron Help You? 141
Conveyor Stores Panels for Air Drying 144
Power Distribution
II. Multiple Primary Feeders, Network Systems 145
Important Tips on Selecting Filter Media 148
How To Get the Most From a Compressed Air System ... 152
Industrial Radio Maintenance 156
Construction Cost Estimating
XI. Acoustical Tile, Resilient Flooring 159
How To Design Pneumatic-Hydraulic Systems
VI. Designing Handling and Moving Devices 161
Tough Packing Gets Tough Job 165
Cooling Water Troubles and Treatment
II. Deposit Prevention, Tower Lumber Protection 168

REGULAR DEPARTMENTS

'Round About With the Editors 2
Bulletins and Catalogs 25
Backtalk and Forethoughts 34
Plant Engineers' Digest 44
Operation and Production 64
Construction Briefs 91
What's Just Ahead in This Issue? 111
News from the Plants 176
New Plant Construction 178
New Products and Processes 216
Review of New Books 290
Data File of Commercial Literature 300
Advertisers' Index 327

The magazine that helps plant engineers with their everyday problems

Volume 14, No. 5 Circulation of this issue 51,820

IT'S EC&M FOR A COMPLETE LINE OF SYNCHRONOUS MOTOR STARTERS!

FOR ALL LOW VOLTAGES AND FOR 2200-4800 VOLT POWER SYSTEMS!

Here's Why EC&M Pushbutton Automatic Starters Do The Job Better...

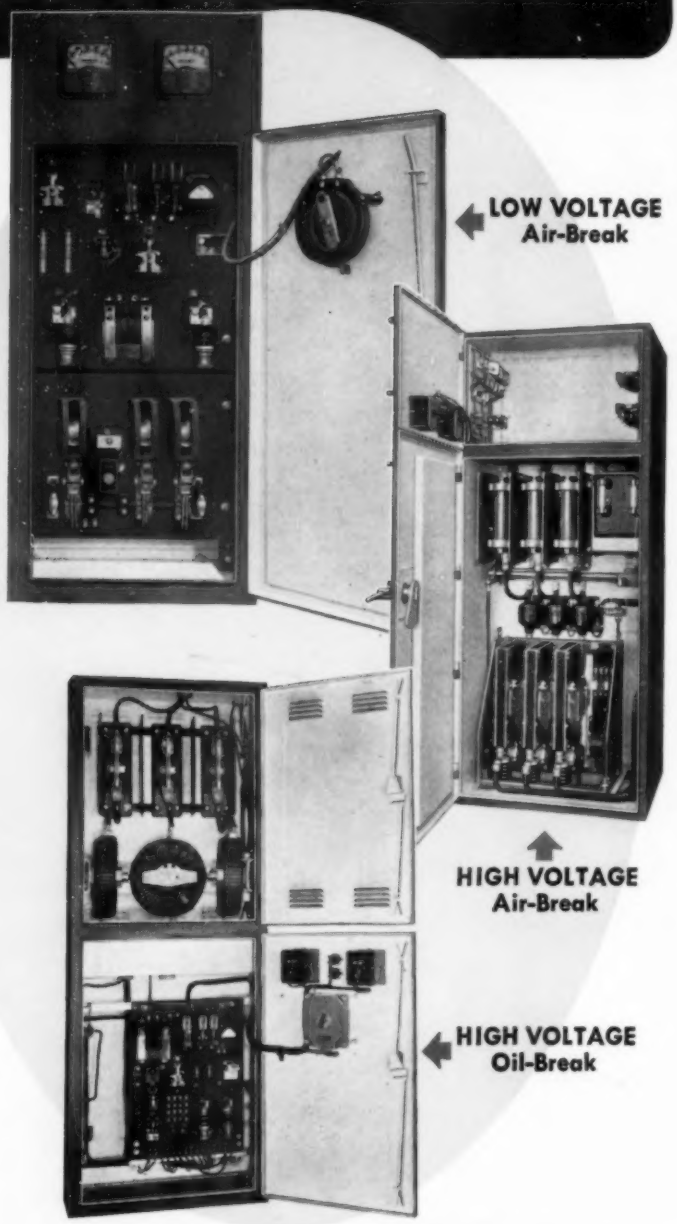
Complete protection during starting, acceleration and while running at synchronous speed.

Motor pulls into step without delay because field is applied under best conditions for synchronization.

Automatic field removal and re-synchronization allow motor to accelerate and re-synchronize after voltage dip or momentary overload.

Easily installed because all internal wiring is complete.

Full or reduced voltage starting All high voltage starters available in 3 ratings: (*1*) 50,000 KVA (certified) interrupting capacity—(*2*) with power-type, current-limiting fuses—(*3*) VALIMITOR® (volt-ampere-limitor), the bus may be of unlimited KVA.



Write for Bulletins 8200 and 8820

SQUARE D COMPANY

EC&M DIVISION • CLEVELAND 28, OHIO

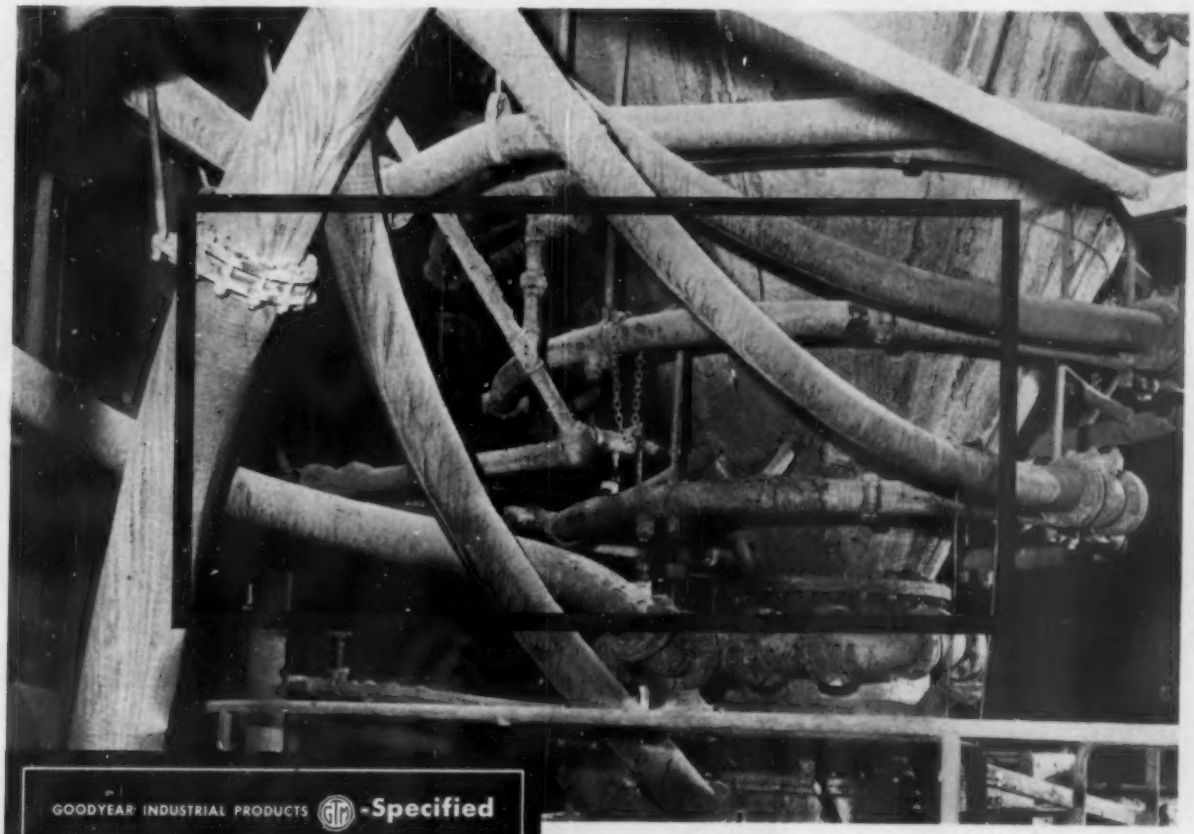
wherever electricity is distributed and controlled

8587

For more facts circle 501 on Reply Card

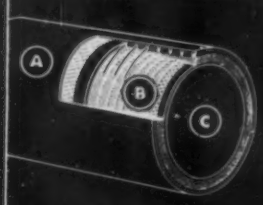
Taking 8,778,000 tons of coal to the cleaners in 5 years would have been impossible for the heaviest steel pipe. But it proved no problem to the Diversipipe recommended by the G.T.M. – Goodyear Technical Man – for the cleaning plant at this big Eastern mine. More than 650 feet of this rugged rubber pipe was installed there when the plant was new. Ever since, it's been handling both coal and silica-sand slurry–materials known to eat through high-carbon steel in a matter of months. Yet today – after averaging more than a million and a half abrasive tons a year for 5½ years–carrying it around numerous bends that invite rapid wear–Diversipipe is still going strong.

Diversipipe–T.M. The Goodyear Tire & Rubber Company, Akron, Ohio



GOODYEAR INDUSTRIAL PRODUCTS GTR -Specified

Diversipipe for handling abrasives and corrosives



A Long-lived abrasion- and weather-resistant cover

B Reinforcement of steel wire helix plus wrapped plies of heavy-duty fabric

C Special rubber tube to withstand abrasion and corrosion

Never consider any industrial materials handling problem "impossible" until the G.T.M. has taken a look and made his recommendation.

Time and time again, he and the Goodyear Distributor have supplied Conveyor Belts, V-Belts or other industrial products that do the job where others fail. Just look under "Rubber Goods" or "Rubber Products" in the Yellow Pages – or write Goodyear, Industrial Products Division, Akron 16, Ohio.

Lots of good things come from

GOODYEAR

THE GREATEST NAME IN RUBBER

For more facts circle 502 on Reply Card

RICHARD H. MORRIS
Editorial Director

EDITORIAL STAFF

THOMAS E. HANSON, *Editor*
R. L. MARINELLO, *Managing Editor*
EMIL B. SKUBIK, *Engineering Editor*
H. E. B. ANDERSON, *Construction Editor*
M. E. WEISSMAN, *Associate Editor*
M. E. HENIKEN, *Equipment Editor*
VERNON T. KEMPF, *Electrical Editor*
BEA BERGHORN, *Editorial Production*
FLORENCE JARRETT, *Editorial Assistant*
HELEN MULLANEY, *Editorial Assistant*
JAMES E. WILCOX, *Art Director*
RICHARD TREFILEK, *Staff Artist*

KINGSLEY L. RICE, *President*
ARTHUR L. RICE, JR., *Exec. Vice Pres.*
EDWIN C. PROUTY, *Vice Pres.*
E. C. PROUTY, JR., *Secretary*
ARTHUR L. RICE, JR., *Treasurer*
ANDREW W. KRAMER, *Tech. Asst to Pres.*
JOHN O. AARVOLD, *Prod. Manager*
WM. J. SALKELD, *Asst. Prod. Mgr.*
M. M. HOAGLAND, *Research Mgr.*
JOSEPHINE GEAR, *Asst. Adv. Mgr.*

DISTRICT MANAGERS

BOSTON & NEW ENGLAND:
Charles R. Lippold
5 Spring St., Riverside, Conn.
Phone: NEptune 7-2210

NEW YORK: Richard Y. Fuller
842 Graybar Bldg., New York 17, N. Y.
Phones: MUrray Hill 5-3779
LExington 2-0308

PHILADELPHIA: Oscar Wilda
1235 Jericho Road, Abington, Pa.
Phone: TUrner 7-6688

JOHN R. MORRISON, *Western Sales Manager*

CHICAGO: John R. Morrison
Walter Painter
Robert L. Dickson
110 S. Dearborn St., Chicago 3, Ill.
Phone: DEarborn 2-5453

OHIO-MICHIGAN: Robert L. Dewey
557 W. Glenwood St.
North Canton, Ohio
Phone: HYacinth 9-7593

PITTSBURGH: James B. Tafel
404 Frick Bldg., Pittsburgh, Pa.
Phone: COurt 1-4878

CALIFORNIA:
Connie J. Grabb, Jr.
1145 Wellington Ave., Pasadena, Calif.
Phone: MUrray 1-6004

DENVER: McDonald-Thompson
Robert H. Heidersbach
620 Sherman Street
Denver 3, Colo.
Phone: KEystone 4-4669

WASHINGTON-OREGON:
McDonald-Thompson
Harry Abney, 1008 Western Ave.
Seattle 4, Wash. Phone: MAin 3-3766
Don el Crary, Times Bldg.
Portland 4, Ore., Phone: CApitol 2-5146

SOUTHWEST: McDonald-Thompson
Parker Harris
2727 Oak Lawn Ave.
Dallas 19, Texas—Phone: LAkeside 1-1266
Frank N. Vickrey, Rm. 214
3217 Montrose Blvd., Houston 6, Texas
Phone: JAckson 9-6711

GREAT BRITAIN:
Brayton Nichols, Director
The American Magazine Group
151 Fleet St., London E.C.4, England

BPA NBP

Copyright 1960 by Technical Publishing Co., 308 E. James St., Barrington, Ill.

'ROUND ABOUT

with the editors in field and office

Edited by R. L. Marinello

Plant Engineering Manager

James Gamble has been appointed plant engineering manager at Ford Motor Company's Indianapolis plant. He was formerly maintenance superintendent at the company's Transmission and Chassis Division plant in Sterling, Michigan. He succeeds H. P. Jones, who has been reassigned as superintendent of a group of the plant's cold heading operations.

Gamble joined the company as a toolmaker at the Mound Road axle plant near Detroit in 1947. He was promoted successively to leader, foreman and general foreman, and in 1953 was appointed to head all maintenance activities at the plant. He was appointed to the Sterling plant post in 1956.

Specs for Hardwood Pallets

READERS WILL be interested in obtaining a copy of the new specifications and grades for hardwood pallets. The booklet covers such technical material as: species of lumber; styles, designs and constructions of pallets; designation of pallet types; dimension of pallet parts; tolerances; methods of fastening and their applications; and others.

This new publication supersedes the Minimum Standard Specifications for Warehouse, Permanent or Returnable Pallets, which was issued on June 21, 1954. It is designed for the assistance of all pallet users who purchase hardwood pallets.

Copies of the new booklet, Specifications and Grades for Hardwood Warehouse, Permanent or Returnable Pallets, may be obtained from National Wooden Pallet Manufacturers Association, Barr Building, Washington 6, D. C. The price for the 20-page booklet is 50 cents.

Assistant Maintenance Head

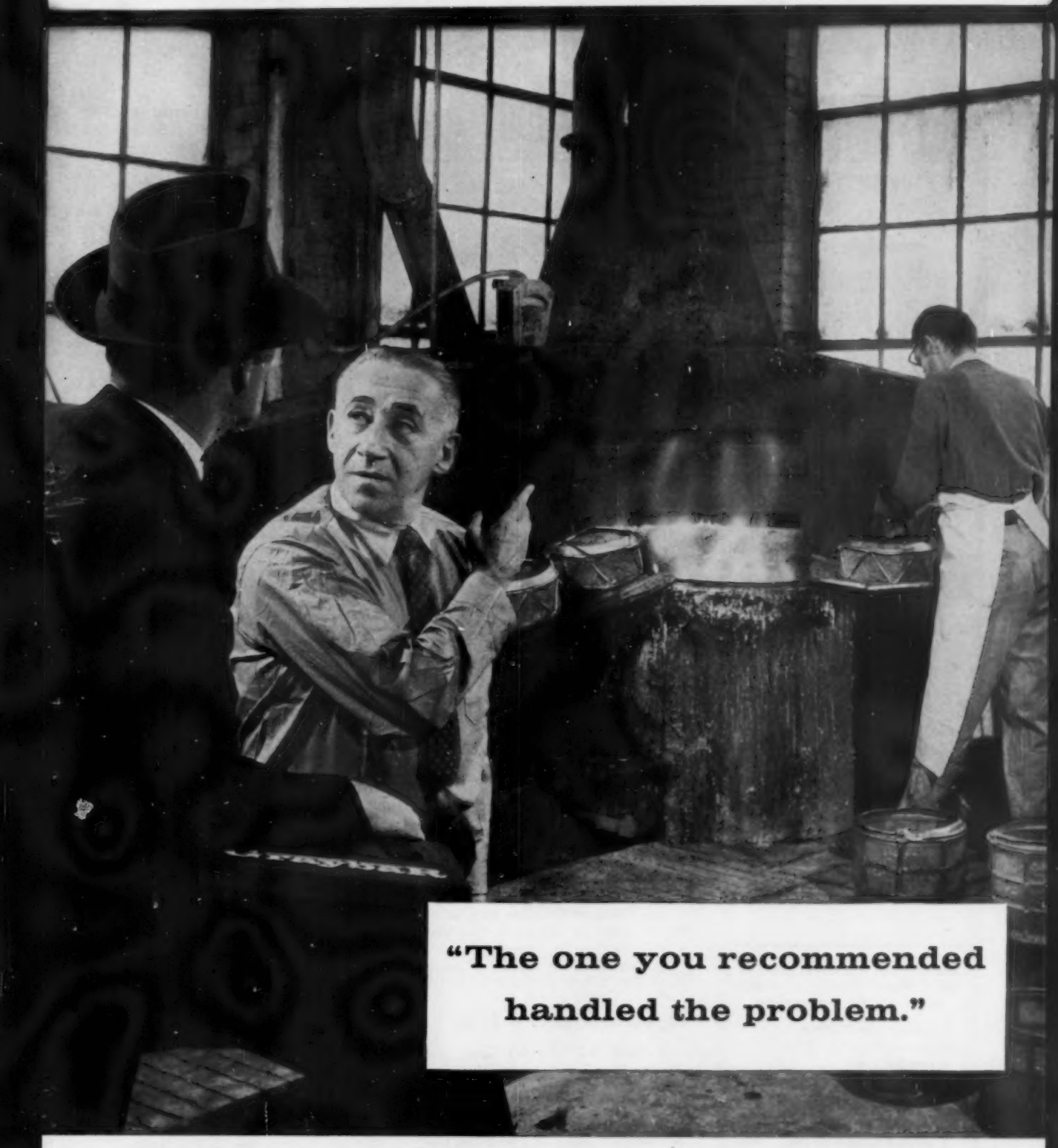
William N. Cooper has been named assistant superintendent of maintenance at the Campbell Works of The Youngstown Sheet and Tube Company, Youngstown, Ohio.

He started with the company in 1948 as a student engineer. He previously had served as night master

Engineering Editor E. B. Skubik Tours Chemstrand Facilities

Paul Darmer, left, plant engineer of Chemstrand's Decatur, Alabama, plant, and Ralph Jones, right, planning and scheduling supervisor, flank visitor Scoop Skubik, Engineering Editor of Plant Engineering magazine. In his tour of the facilities, Scoop met several key people in the Plant Engineering Department and observed many of the operations involved in the production of Acrilan.

Subscriptions: U.S.A. $10, Canada $11. Other countries $12 per year. Single copies $1. Change of address: Send to PLANT ENGINEERING, Circulation Division, Barrington, Illinois. Please supply position title, company name, company address. Request must reach us by the 15th of month to make the change effective with following month's issue. Published monthly and accepted as controlled circulation publication at Chicago, Ill.



"The one you recommended handled the problem."

No doubt your problem is different from the ventilation "hot spot" above. But if it can be solved electrically, your Graybar man is *interested* . . . qualified to *help* . . . and has the *right product* to match the need.

With a catalog of 100,000 electrical items, how can he miss?

For an impartial recommendation, call Graybar first. We'll work with you or your electrical contractor. 94

GraybaR

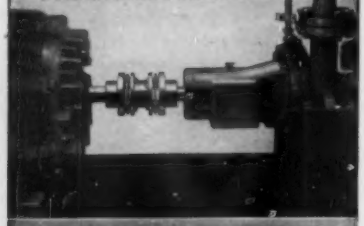
ELECTRIC COMPANY, INC.

Everything Electrical — Graybar Electric Company

420 LEXINGTON AVENUE, NEW YORK 17, N. Y. • OFFICES IN OVER 130 PRINCIPAL CITIES

For more facts circle 503 on Reply Card

THOMAS
FLEXIBLE COUPLINGS
Protect your PUMPS
and other
Indispensable
MACHINERY!



NO LUBRICATION
NO MAINTENANCE
NO WEARING PARTS

Future maintenance costs and shutdowns are eliminated when you install Thomas Flexible Couplings. These all-metal couplings are open for inspection while running.
They will protect your equipment and extend the life of your machines.
Properly installed and operated within rated conditions, Thomas Flexible Couplings should last a lifetime.

UNDER LOAD and MISALIGNMENT ONLY THOMAS FLEXIBLE COUPLINGS OFFER ALL THESE ADVANTAGES:

- Freedom from Backlash
- Torsional Rigidity
- Free End Float
- Smooth Continuous Drive with Constant Rotational Velocity
- Visual Inspection While in Operation
- Original Balance for Life
- No Lubrication
- No Wearing Parts
- No Maintenance

Write for Engineering Catalog

THOMAS FLEXIBLE COUPLING CO.
WARREN, PENNSYLVANIA, U.S.A.

For more facts circle 504 on Reply Card

'ROUND ABOUT

mechanic, general steam foreman and supervisor of maintenance planning and scheduling.

Radioisotope Training Program

RADIOISOTOPE COURSES are offered at the Special Training Division of the Oak Ridge Institute of Nuclear Studies to assist scientific, technical, medical and industrial personnel on how to use radioisotopes safely and efficiently within their individual fields.

Attendance is limited to those individuals who are using or who may be expected to use radioisotopes in the near future. During the course, close liaison is maintained with the Atomic Energy Commission in presenting the latest information concerning the organization of radioisotope programs.

The training program is handled in four courses. Here is a brief description of each course:

Course A: Basic Radiation Physics (two weeks); Course B: Radioisotope Research Techniques (two weeks); Course C: Industrial Radioisotope Techniques (two weeks), presented simultaneously with Course B; and Course D: Special Industrial and Research Techniques (two weeks). Each course consists of lectures and laboratory sessions.

Schedule of the courses for the rest of this year are: July 25 to August 5, Course A; August 8 to 19, Course B and C; and August 22 to September 2, Course D.

September 6 to 16, Course A; September 19 to the 30; Courses B and C; and October 3 to the 14, Course D.

Additional information may be obtained from Dr. Ralph T. Overman, Chairman, Special Training Division, Oak Ridge Institute of Nuclear Studies, P. O. Box 117, Oak Ridge, Tenn.

Engineering Changes at Avisco

Edward L. Woolley has been named plant manager at the Fredericksburg, Va., plant of American Viscose Corporation.

A. W. Hogeland, at present assistant chief engineer of the Film Division and Fredericksburg plant engineer, has been appointed chief engineer of the Film Division while continuing in his present capacity of plant engineer.

Woolley joined the company in 1940 as design engineer on various plant expansion projects, including Front Royal, Va., and Meadville, Pa. He was assistant plant engineer in Meadville from 1945 to 1954, at which time he was transferred to Fredericksburg as plant engineer. In 1958, he was appointed chief engineer of the Film Division in addition to his position as Fredericksburg plant engineer. In April, 1959, he was named manufacturing superintendent of the Fredericksburg plant and on September 15, 1959, became assistant plant manager.

Hogeland was appointed design engineer of the Chemical Processing Group in 1950 where he remained until his transfer to the Film Division. On January 1, 1959, he was transferred to the Fredericksburg plant as assistant plant engineer and was promoted to plant engineer on April 3, 1959. He was made assistant chief engineer of the Film Division on September 15, 1959, in addition to his position as plant engineer of the Fredericksburg plant.

Engineering Appointment

Harry R. Bentley was named plant manager of Chrysler Corporation's Trenton, Michigan, Engine plant. He had been plant manager of the company's Mound Road Engine plant in Detroit since February, 1959.

He joined the company in 1942 as a supervisor of construction engineering at the Evansville, Ind., Ordnance plant. In 1944, he was transferred to the X-100 plant (Division of Oak Ridge Atom Bomb Plant) as chief layout engineer.

Since 1945 he has served successively as assistant plant engineer, plant engineer, and division production planning manager.

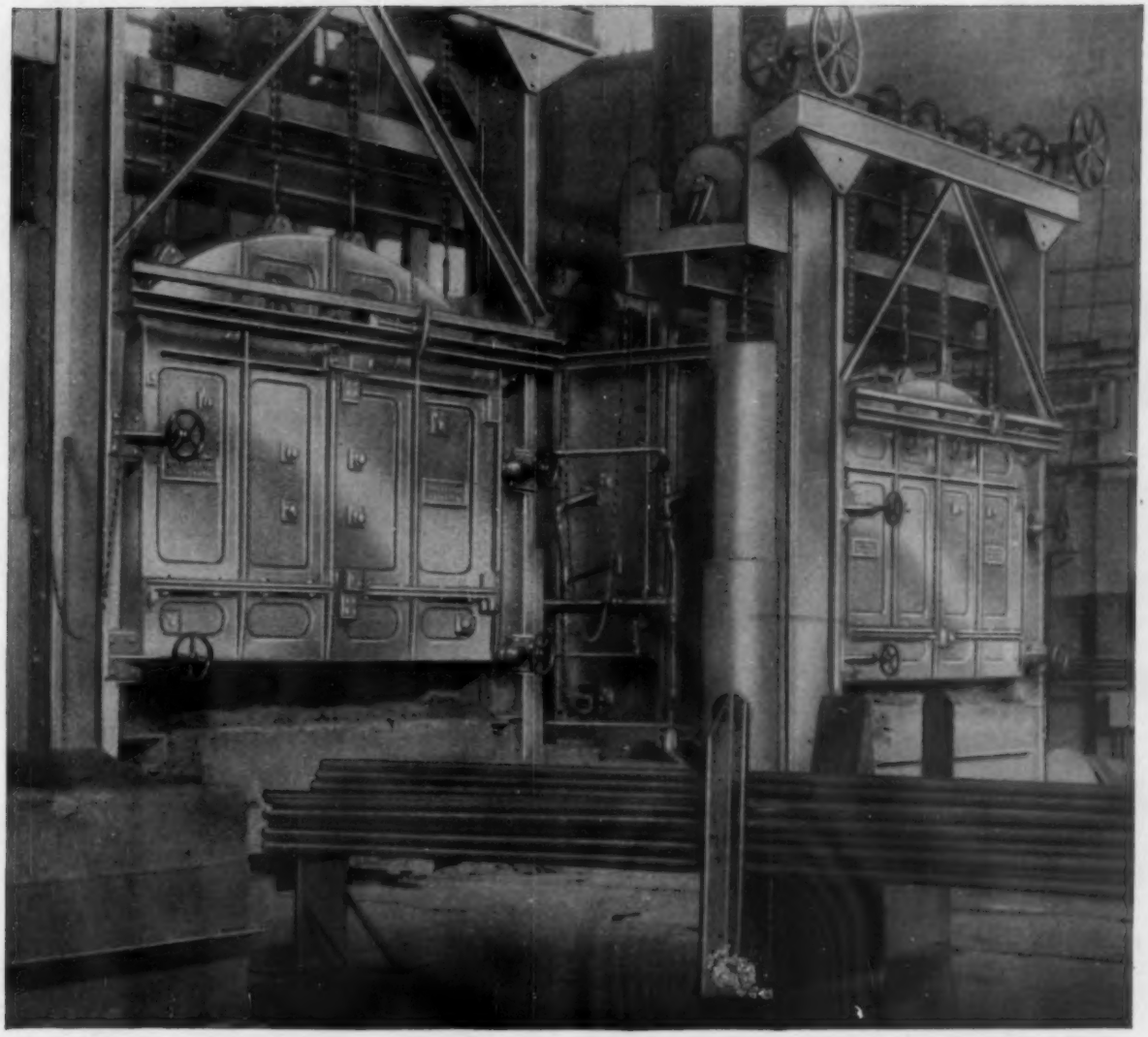
Spark-Test Technique Shows Characteristics of Metals

SPARKING CHARACTERISTICS of metals can be determined by a technique devised by the Navy for selection of materials safe for use in explosive atmospheres.

The technique involves a spark test using a gasoline and oxygen-enriched air mixture. A clear distinction is made between safe and unsafe metals. Among metals identified as safe to use in tools or other devices in explosive atmospheres are manganese bronze, phosphorus bronze, aluminum bronze, commercial brass, aluminum and beryllium copper. Unsafe metals include carbon steel, carbon tool steel, high-speed tool steel, stainless steel and Monel.

The report, PB 151650, Sparking Characteristics of Metals, 18 pages, 50 cents, may be ordered from Office of Technical Services, U. S. Department of Commerce, Washington, D. C.

920 LEXINGTON AVENUE, NEW YORK 17, N. Y. • OFFICES IN OVER 130 PRINCIPAL CITIES
For more facts circle 503 on Reply Card



paint on "minimum maintenance"

The Finest Paints Made with Aluminum are made with REYNOLDS ALUMINUM PIGMENT

Aluminum paint prevents rust and corrosion... provides superior heat protection

Aluminum flakes rise to the surface of a coat of aluminum paint—forming a solid metal shield that moisture and corrosive gases just can't penetrate. Decay and deterioration are drastically reduced. And paint made with Reynolds Aluminum Pigment holds heat in, increases efficiency. It's the coating that puts a *metal shield* over any surface. *Reynolds Metals Company, P.O. Box 2346-PL, Richmond 18, Virginia.*

REYNOLDS ALUMINUM

Watch Reynolds TV shows—"ALL-STAR GOLF," "BOURBON STREET BEAT," and "ADVENTURES IN PARADISE"—ABC-TV

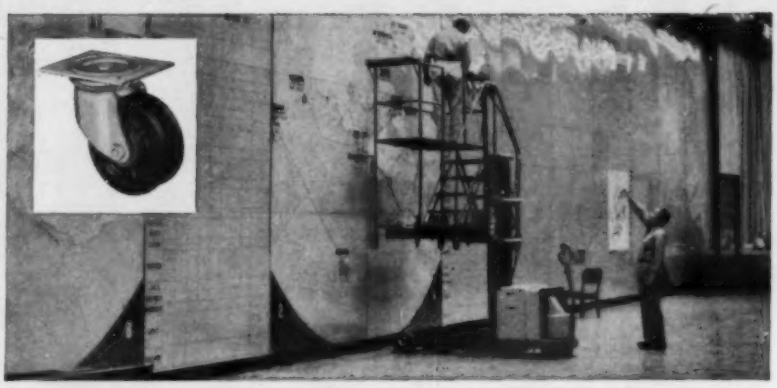
For more facts circle 505 on Reply Card

MATERIALS-HANDLING NEWS

NEW AND UNUSUAL APPLICATIONS OF BASSICK CASTERS THAT MIGHT BE ADAPTED TO YOUR HANDLING PROBLEMS

THIS CASTER GUIDES FLOATING ROOF OF OIL STORAGE TANK

Constant movement plus submersion in oil doesn't bother these Bassick casters and wheels. They're used on the roof of 67,000 barrel tank at the Tidewater Oil Tank Storage Farm in San Pedro, California. There's another Bassick wheel *inside* the tank mounted on pontoons that *float* to the top when the tank is full and help center the floating roof. This is typical of the way Bassick quality wheels and casters solve problems saving time, money and work.

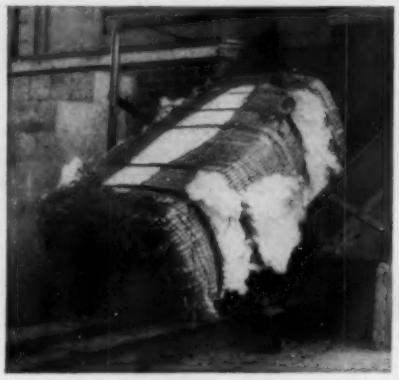


The Strategic Air Command Where Fighting Facts Move on Bassick Casters!

At the Strategic Air Command's $10,000,000 Control Center, giant map panels (8 ft. x 20 ft.) roll quickly and smoothly on Bassick Grooved Wheel Casters. Weather information, operational facts, plans, all the vital information needed to direct global forces in peace or war goes *where* it's wanted . . . *when* it's wanted. Bassick grooved wheel casters and angle iron track offer a basic, unique, inexpensive and flexible means of moving engines, tools, parts and finished products at low cost. Simple means of movement through assembly lines or into and out of warehouse.

KING COTTON FLOATS TO MARKET ON BASSICK CASTERS

For 10 years, the Joanna Mills in South Carolina have moved giant 700 pound bales of cotton around like so many empty cardboard boxes. The real work is done by 33 dollies equipped with Bassick Floating Hub Casters. They have increased speed of movement by 35% and absorb the shock when bales slide down chute to waiting dollies. Saves time and makes work easier for employees.



STORES AND WAREHOUSES SAVE TIME AND MONEY WITH THIS CASTER

These Bassick Diamond Arrow Casters feature the highest quality steel and unique, two-level ball race for easiest swiveling. Economical and versatile, they are ideal for light duty where load capacities range from 100 to 250 lbs. They give quiet, easy action to light-duty trucks, service trucks, dollies and similar equipment. Attachments such as special stems, wide wheels and side brakes make this series particularly adaptable for many different uses. O.31

SEALED BEARINGS DEFY DIRT AND MOISTURE

Lubrication seals prevent dripping grease . . . avoids hazards

This is a beauty! Special lubrication seals on Bassick casters keep floors clean by eliminating the hazards of dripping grease. Seals are engineered to remain effective for the life of the caster. They can be easily flushed and new grease added without disassembly.

Ask Your Distributor!

Local industrial distributors carry popular Bassick models in stock. They will be glad to recommend the most efficient caster to solve your materials handling problems.

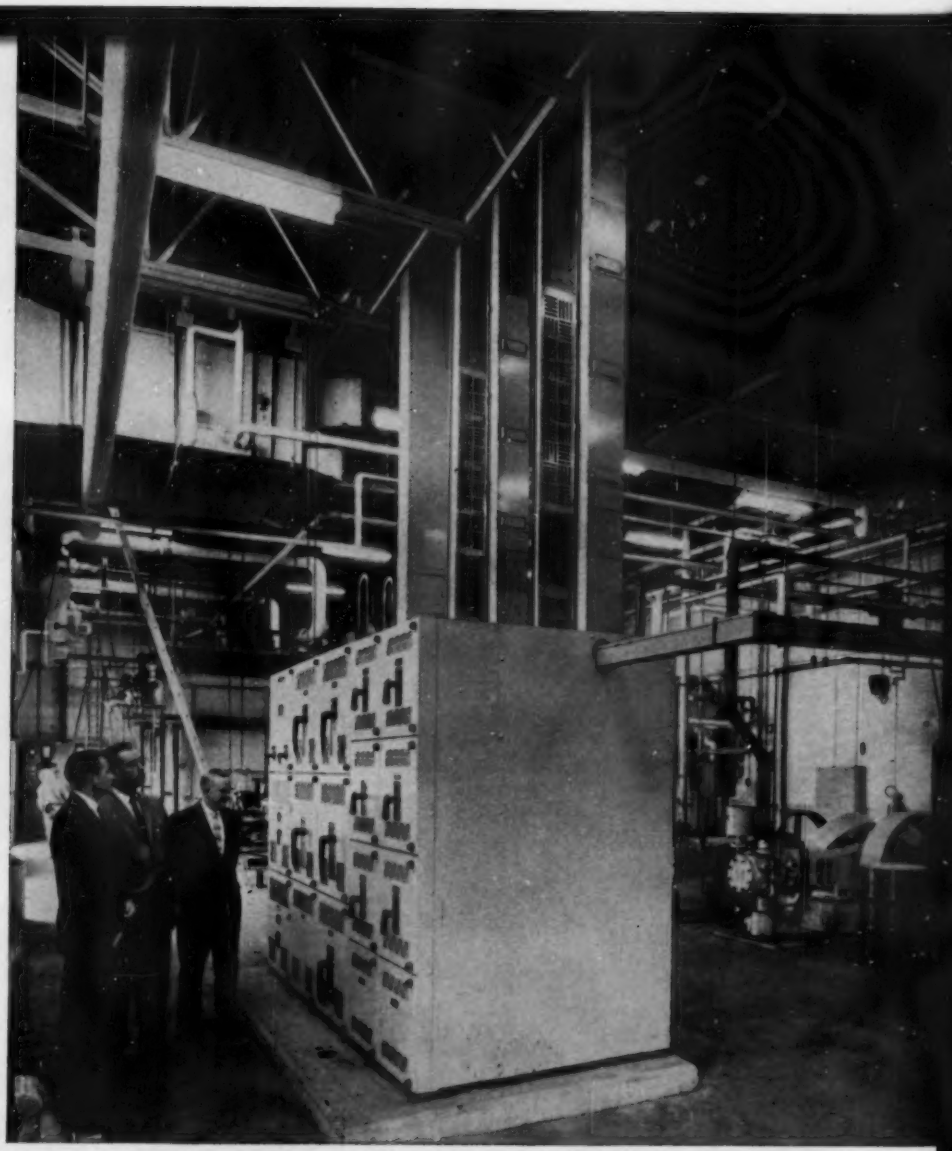
THE BASSICK COMPANY
BRIDGEPORT 5, CONN.
IN CANADA:
BELLEVILLE, ONT.

Symbol of SW Excellence
Bassick
A DIVISION OF
STEWART-WARNER CORPORATION

For more facts circle 506 on Reply Card

Peter Paul Powers-Up
new candy plant
to serve growing market
YOU CAN BE SURE ... IF IT'S Westinghouse

COVER PHOTO: Conveyor carries finished "indescribably delicious" candy bars to packaging stations.



J. R. Miller, Westinghouse Construction Sales Engineer; D. J. Taylor; and H. P. Bettge discuss protection provided by drawout-type DB circuit breakers in the Westinghouse low-voltage switchgear. Blank compartments have been allowed for future breaker additions. Four bus duct feeder runs from this metal-enclosed switchgear distribute power throughout the entire plant.

J-94137-2

Parking lot of the new Peter Paul, Inc., plant in Frankfort, Indiana, has Westinghouse OV-20 luminaires installed on twin mast arms. Westinghouse mercury-vapor lamps in the fixtures combine glare-free visibility with virtual elimination of maintenance.

D. J. Taylor, The Sanborn Electric Co., Electrical Contractor; H. P. Bettge, J. M. Rotz Engineering Co., Consulting Engineers; and Lloyd Williams, Branch Manager, WESCO, Indianapolis, inspect one of the Westinghouse 40-kvar, type MDP capacitor assemblies in the main production area. Overhead bus duct is already installed to accommodate the addition of two more candy production and packaging lines. Mounted along the wall are five type DT-3 dry-type transformers to supply low voltage for lighting and power receptacles. Industrial fluorescent fixtures, type 2WVO, are used throughout entire production area.

Candymaker's plant has reserve electrical capacity to triple production

The new Frankfort, Indiana, plant was built by Peter Paul, Inc., to provide for the manufacture and distribution of its nationally known products, "Mounds" and "Almond Joy" for the Midwestern section of the U. S. The plant has two manufacturing and packaging lines. Anticipating the need for plant expansion, the owner, consultant and electrical contractor worked with Westinghouse to plan and install an electrical system that allows for additional production lines in the future . . . *without adding to the present electrical distribution system.*

Careful analysis of the electrical system led Westinghouse engineers to propose use of bus duct in place of conduit and cable throughout the plant. Plug-in-type bus duct not only permits ready addition of feeders when needed but actually *saved in initial cost* as compared to the original conduit and cable specifications.

Incoming low-impedance bus duct carries 4000 amperes from utility company transformer bank to main Westinghouse switchgear. Full power distribution within the plant is provided by runs of 800- and 1000-amp plug-in bus duct and 800- and 2000-amp low-impedance bus duct. This 480-v power is reduced to utilization levels by use of lightweight Westinghouse dry-type transformers mounted, in most cases, above the production areas.

All circuits in the plant are protected by Westinghouse circuit breakers; not one fuse is to be found in the plant. Circuit breakers protect against short circuits and overloads and eliminate loss of valuable down time in case of faults.

(continued)

YOU CAN BE SURE...IF IT'S

Westinghouse

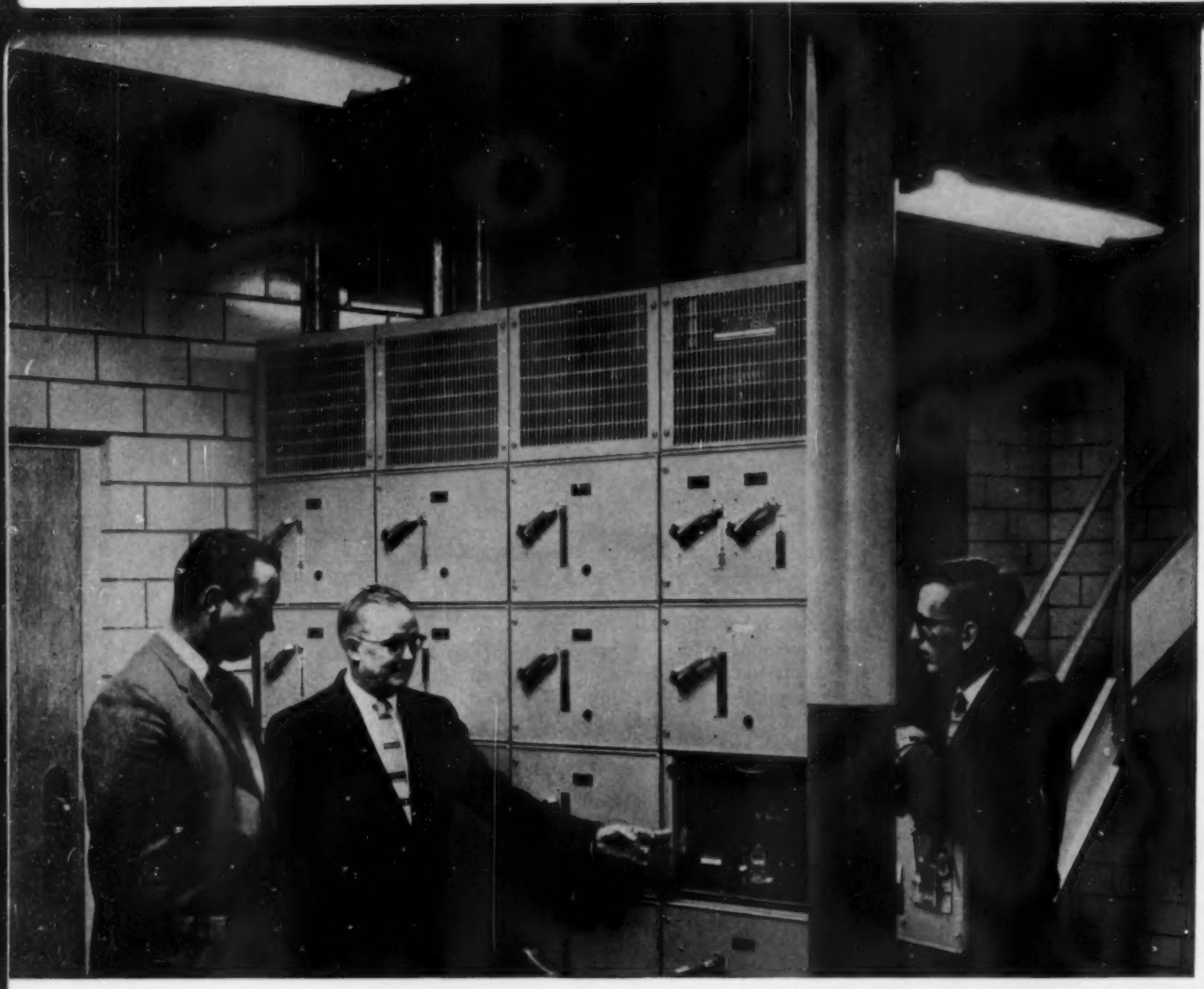
J-94137-3

J. R. Miller and H. P. Bettge tour the box assembly area. End of an 800-amp, low-impedance bus duct adapts to a run of plug-in bus duct to supply box assembly machine motors. A 15-kva type EP dry-type transformer, above, feeds the flush-mounted type NLAB panelboard shown below for distribution to lighting circuits. The 40-kvar type MDP capacitor unit maintains correct voltage and power factor for maximum lighting and motor efficiencies. Of their capacitor investment, Mr. Bettge says, "They will pay for themselves in three years."

W. B. McKenzie, Peter Paul Chief Engineer; E. C. Eigenbrot, Assistant Engineer; and D. W. Manes, Westinghouse Bus Duct and Panelboard Specialist, inspect a type CDP convertible distribution panelboard. Westinghouse AB De-ion® circuit breakers in panelboard protect against overloads and short circuits.

W. B. McKenzie inspects one of the new Life-Line® right-angle gearmotors. This 1½-hp, 45-rpm Moduline* gearmotor drives the chocolate circulating pump. Westinghouse Moduline gearmotors provide quiet, efficient operation for power transmission needs.

*Trade-Mark



H. P. Bettge (center) describes advantages of Westinghouse motor control center to D. J. Taylor, and M. C. Wetterlin, Westinghouse Sales Engineer. Grouping of motor controls saves on inspection time and reduces service problems. The class 11-350 Control Center has blank space available at the bottom where starter units can be added when necessary.

Reserve electrical capacity to triple production *(continued)*

Westinghouse can help with any of your electrical planning and construction requirements. See your Westinghouse distribution outlet, or write: Westinghouse Electric Corporation, Box 868, Pittsburgh 30, Pa.

OWNER: Peter Paul, Inc., Naugatuck, Conn.

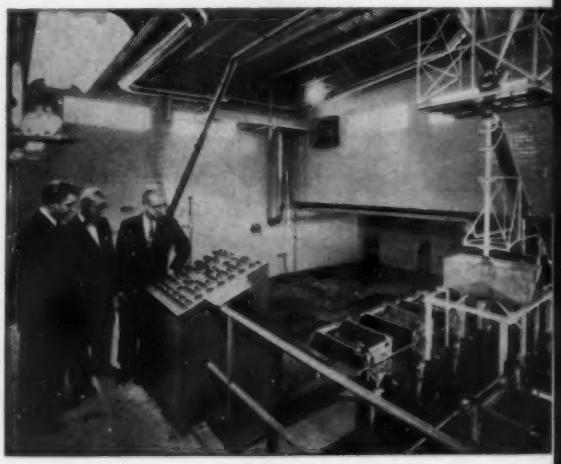
ARCHITECT: Daggett-Naegele and Daggett, Inc., Indianapolis, Ind.

CONSULTING ENGINEER: J. M. Rotz Engineering Co., Indianapolis, Ind.

ELECTRICAL CONTRACTOR: The Sanborn Electric Co., Indianapolis, Ind.

WESTINGHOUSE DISTRIBUTOR: Westinghouse Electric Supply Co., Indianapolis, Ind. J-94127-4

R. E. DeRaismes, Plant Manager of the Frankfort division; Lloyd Williams; and L. J. Hougland at the operator's control console. This centrally located desk utilizes standard Westinghouse pushbuttons and indicating lights for remote starter operation in the motor control center.



YOU CAN BE SURE...IF IT'S

Westinghouse

WATCH "WESTINGHOUSE LUCILLE BALL-DESI ARNAZ SHOWS" CBS TV ALTERNATE FRIDAYS

For more facts circle 507 on Reply Card

Plexiglas glazing could have saved this replacement cost!

Have you checked the figures lately on your cost of replacing broken windows? Chances are that it is high, and here's a money-saving solution. Use PLEXIGLAS® acrylic plastic. PLEXIGLAS window glazing withstands impact, shock and vibration. It is lightweight . . . weather-resistant . . . easily installed. Call your nearest distributor for advice and service on clear transparent sheets or tinted and translucent colored sheets. He is listed under PLEXIGLAS in the Plastics section of telephone directories in major cities.

Chemicals for Industry

ROHM & HAAS COMPANY

WASHINGTON SQUARE, PHILADELPHIA 5, PA.

In Canada: *Rohm & Haas Company of Canada, Ltd., West Hill, Ontario*

CALL YOUR AUTHORIZED PLEXIGLAS DEALER

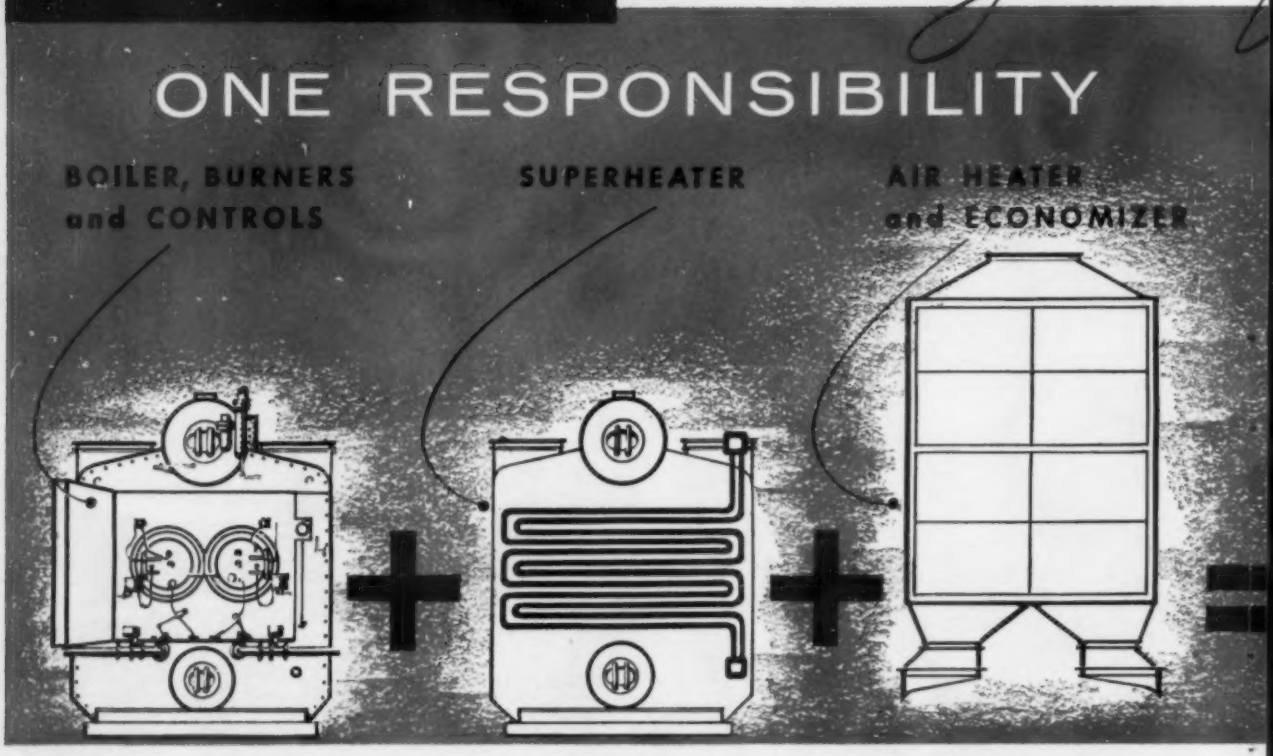
PROMPT DELIVERY • TECHNICAL ADVICE • FULL RANGE OF SIZES AND COLORS

For more facts circle 508 on Reply Card

For more facts circle 507 on Reply Card

KEYSTONE *Package*

ONE RESPONSIBILITY

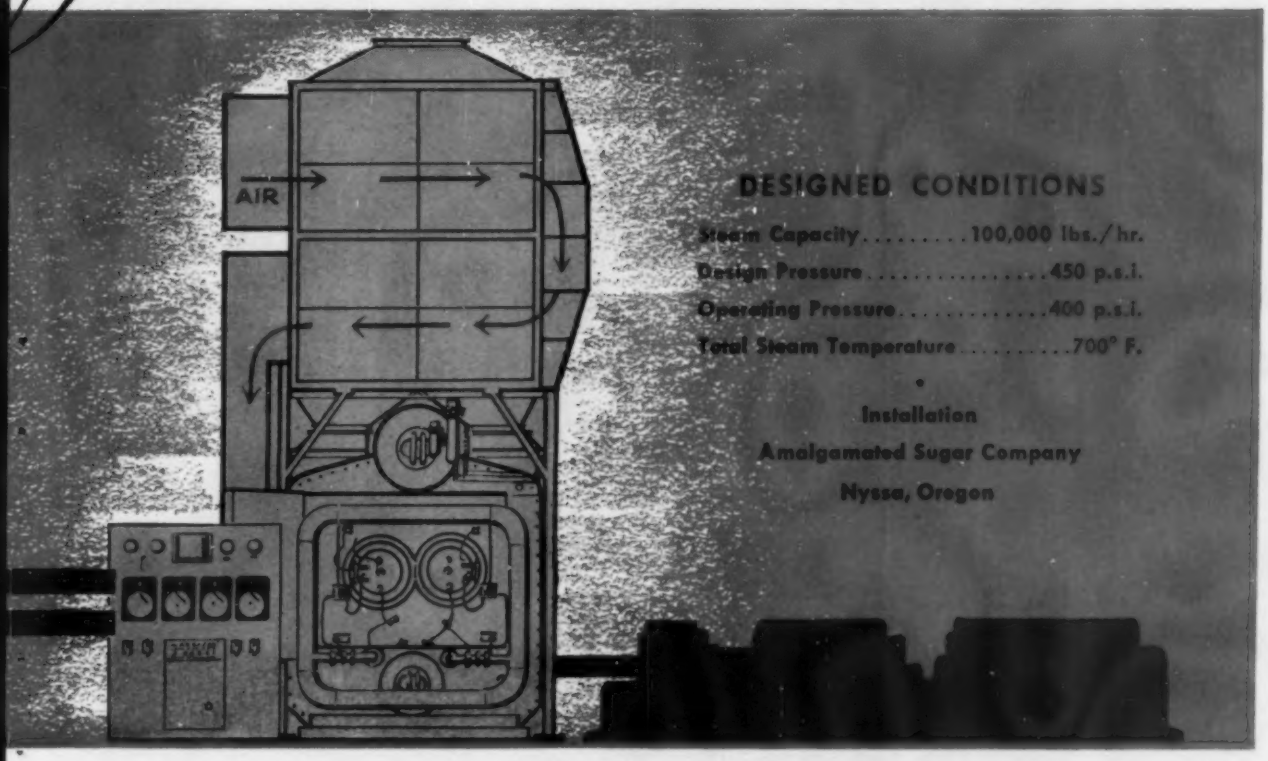


"Some of the best liked features of our KEYSTONE Steam Generator"

Amalgamated Sugar Company
Nyssa, Oregon

- Ease of installation
- The large turn-down ratio of the gas burners
- Fast response to steam demands
- Minimum space for maximum capacity
- Minimum of attention required for operation
- High over-all efficiency of unit

for Power Generation



Low Capital Investment

HERE ARE the power plant components normally associated with large field erected steam generators. These are packaged in a low cost, highly efficient installation. The boiler utilizes an integral Drainable Superheater to produce high temperature steam for use in a generating turbine. The Air Heater preheats the combustion air to provide efficiencies equal to utility standards.

Low first cost of this packaged installation saves considerable money over the cost of a similar field erected unit with no decrease in quality or efficiency.

If your problem is one of adding high pressure and high temperature steam for process work, power generation, or at low capital expenditure, to assist your present boilers during peak loads, then investigate Power Packages by Erie City Iron Works. Write for additional information in Bulletin SB-5905-E.

You can depend on ERIE CITY *Since 1840* *for sound engineering*

ERIE CITY IRON WORKS · Erie, Pa.

STEAM GENERATORS • SUPERHEATERS • STOKERS • PULVERIZERS
ECONOMIZERS • WASTE HEAT BOILERS • OIL and GAS BURNERS
AIR PREHEATERS • FIRE and WATER TUBE PACKAGE BOILERS

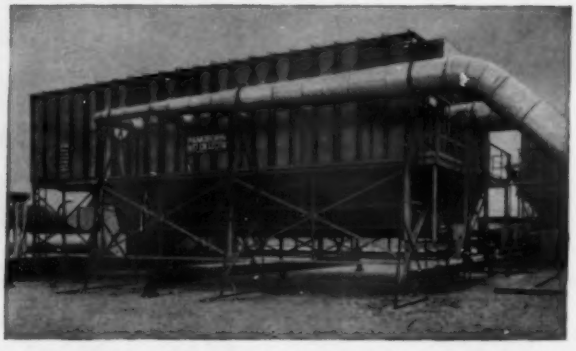
For more facts circle 509 on Reply Card

Operation: Dust Control

(One of a series)

At National Cash Register, 10 tons of wood

Dust is trapped at the source by hoods engineered for the individual job . . .



. . . and is piped from 160 locations to five giant Pangborn Cloth Bag Collectors.

shavings, chips and dust are collected daily!

Mammoth is the word for the 5-floor woodworking plant of National Cash Register headquarters, Dayton, Ohio. Processing nearly 300,000 sq. ft. of lumber each month, this operation generates 10 tons of waste material per day.

To protect NCR employees, equipment, plant and neighborhood, five Pangborn Cloth Bag Dust Collectors trap 90 cu. ft. of fine dust for disposal and, during the winter months, permit recirculating of the already-heated, cleaned air. This efficient performance of Pangborn Dust Control saves thousands of dollars in heating costs during the cold weather. In addition, a neighborhood and health nuisance has been eliminated; equipment maintenance and plant housekeeping costs have been minimized.

Dust a continuing problem in *your* plant? Talk to the Pangborn man in your area or write: PANGBORN CORPORATION, 3200 Pangborn Blvd., Hagerstown, Md. *Manufacturers of Dust Control, Blast Cleaning, Vibratory Equipment—Rotoblast® Steel Shot and Grit.®*

Pangborn
OF HAGERSTOWN

For more facts circle 510 on Reply Card

STRONG strainers in condensate line in new Cleveland skyscraper.

select the STRONG® strainer *designed for you!*

IN steam, air, gas, water, oil or chemical systems, a *correctly selected* strainer pays for itself many times. It protects expensive equipment (traps, control instruments, meters, etc.) and reduces over-all maintenance and service costs.

Assure your system maximum protection from dirt, scale, sludge and sediment . . . specify *the* STRONG strainer designed for your requirements.

Sizes: from ¼" to 8"

Service: 250 psi at 450° F to 2500 psi at 1100° F

Screens: stainless screens with .027", .045", .062", or .125" perforations (at no extra cost)

Types: "Y" or Angle with screwed or socket-weld (flanged) connections

Materials: semi-steel, ductile-iron, bronze, Monel, cast or block steel, or new all-stainless or Hasteloy

STRONG'S extensive line of rugged, high-quality strainers are available from your local STRONG distributor. Contact him for assistance in selecting the *right* strainer, or write for your copy of STRONG Bulletin SS—21C.

STRONG, CARLISLE & HAMMOND

508 Sandusky Street, Conneaut, Ohio

air traps • strainers • reducing valves • vacuum or pumping traps
continuous blowdown valves • separators • engine stops • F and T traps • safety headgear

For more facts circle 511 on Reply Card

For more facts circle 512 on Reply Card →

GENERAL ELECTRIC
Offers a Complete Line of

ADJUSTABLE-SPEED DRIVES

MECHANICAL
ELECTRIC
ELECTRONIC

TO MEET EVERY APPLICATION REQUIREMENT

Horsepower
1/4 to 1250

TIMED OR CURRENT LIMIT
Acceleration or Deceleration

OPERATES FROM AC POWER SOURCE

R. P. M.
2 to 6000

SPEED RANGE
Up to 200:1

SPEED REGULATION
10% to 0.1%

Constant HP
Constant Torque
Or Both

Remote Preset Speed Control

SELECT YOUR DRIVES *from*
General Electric's Complete Line
Shown on the Following Pages

GENERAL ELECTRIC

GENERAL ELECTRIC *Adjustable-Speed Drives Offer* *A Great Opportunity*

POLYDYNE® DRIVE

Modern, a-c mechanical drive. ¼–25-hp. Speed range to 10:1. New "Equalizer"‡ provides smooth manual or automatic speed control. Produced by Gear Motor & Transmission Components Dept., Paterson, N. J. Write for Bulletin GEA-6806*.

‡ Pat. Pending.

THYMOTROL† *SPEED VARIATOR*

High quality electronic drive. ¼–10-hp. Wide speed range. Small, lightweight. General Purpose and High Performance types. Write for Bulletin GEA-7018 and GEA-7019*.

KINAMATIC® *Speed Variator*

Industry's most versatile electric drive. 1–500-hp. Features Kinamatic motor-generator conversion. Speed range up to 200:1. Precise regulation. Regeneration. Wide variety of power unit, motor and control modifications available. Write for Bulletin GEA-6643*.

Industry's most complete line of modern packaged drives for every performance level, every price range

General Electric adjustable-speed drives are available for every performance level, every price range to help you boost output, improve quality, increase machine flexibility, reduce installation costs, cut your maintenance budget, add substantial profits to your business.

To make possible these advantages, your General Electric sales engineer is backed by an experienced team of adjustable-speed drive specialists—men who work constantly to help you get more out of your machines.

They offer an unbiased, analytical evaluation of your requirements—recommend the adjustable-speed drive that meets the demands of your application most completely and economically.

GENERAL ELECTRIC

to Modernize for Increased Profits

KINATROL✣ SPEED VARIATOR

Outstanding packaged drive value. Compact, versatile eddy current coupling. 3–100-hp. Stepless speeds 1½:1 to 17:1. 2% speed regulation. For complete information write for Bulletin GEA-6885*.

Parmatic SPEED VARIATOR

Power amplistat conversion features hermetically sealed silicon rectifiers. 1–200-hp. Speed ranges to 200:1. Lightweight, quiet and vibrationless. Field proven. Write for Bulletin GEA-7012*.

** Write to Section 821-4, General Electric Company, Schenectady 5, New York.*

In Canada, write Canadian General Electric, Peterborough, Ontario.

✣ Trademark of General Electric Company.

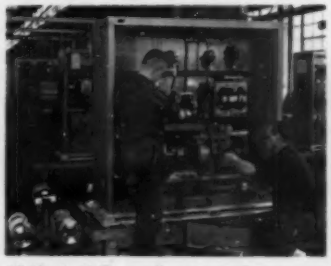
RESEARCH

In product research, G.E. invests more than three times the industry average. You benefit from the most modern features in your G-E drive.

ENGINEERING

General Electric industry and application specialists, familiar with your production process, assure proper selection and design of G-E adjustable-speed drives to meet your specific application requirements.

MANUFACTURING



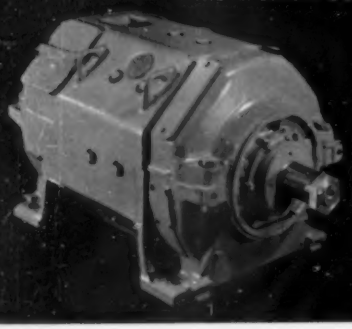
Skilled G-E workers, modern production facilities, standardized components and latest testing methods combine to give you high-quality, adjustable-speed drive equipment, shorter delivery time, lower prices.

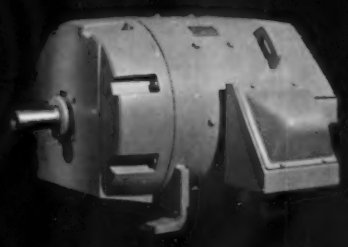
SERVICE

G.E.'s service network offers three-way 'round-the-clock' assistance: start-up service, productive maintenance assistance and complete repair service.

MD ARMORED MOTORS

Industry's most preferred d-c mill motor. 500 to 625-hp. Write for Bulletin GEA-4654C*.





KINAMATIC® D-C MOTORS

Most modern, versatile d-c motor for adjustable speed. 1 to 200-hp. Write for Bulletin GEA-6335*.

AMPLIDYNE POWER AMPLIFIERS

Fast response d-c power source with flexible output characteristics. Write for Bulletin GEA-4053B*.

PLUS . . . *industry's most complete line of drive components for both general purpose and special industry application*

To learn more about the modern capabilities of G-E packaged drives and components, call your nearby General Electric sales engineer. ADJUSTABLE SPEED, a new booklet which outlines G.E.'s complete line of modern packaged adjustable-speed drives, is also available to help you modernize for profits. Ask for Bulletin GEA-6999*.

Write to Section 821-4, General Electric Co., Schenectady 5, N. Y. In Canada, write Canadian General Electric, Peterborough, Ontario.

DIRECT CURRENT MOTOR & GENERATOR DEPARTMENT

GENERAL ELECTRIC

ERIE, PENNSYLVANIA

HEAVY DUTY M-G SETS

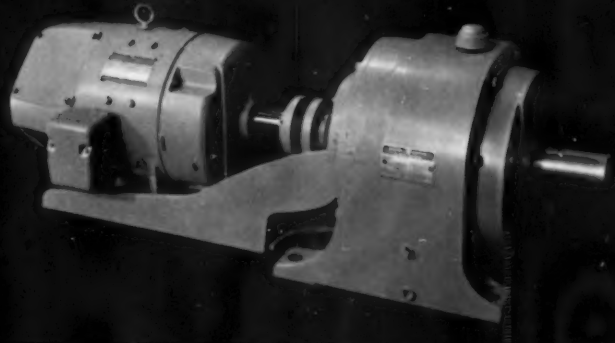
Reliable power conversion for main, auxiliary and process line drives

CD-1000 D-C MOTORS

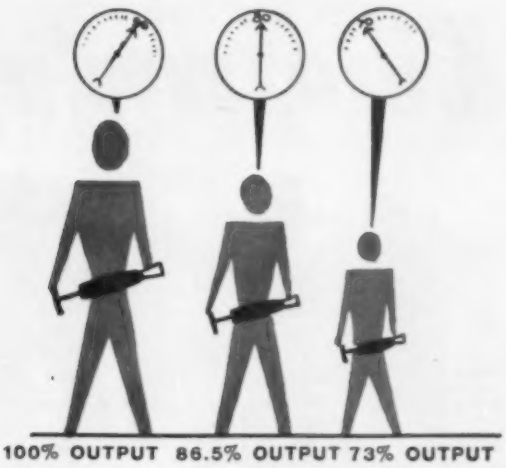
Performance proved. Quality designed. 250 to 1250-hp. Write for Bulletin GEA-5497A*.

ALL-MOTOR GEAR-MOTOR

A-c or d-c. 1 to 75-hp. Simplified maintenance. Produced by Gear Motor & Transmission Components Dept. Write for Bulletin GEA-6704*.



If your tools require a pressure of 90 psi, your production efficiency drops 13½% if pressure falls to 80 psi, and drops 27% if pressure goes down to 70 psig.

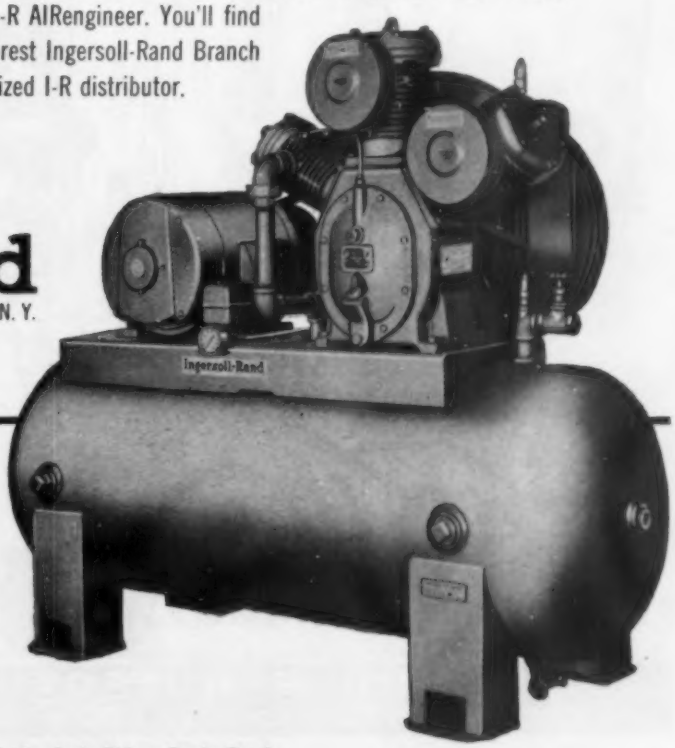


how low air pressure ***shrinks your manpower!***

EXPERIENCED PRODUCTION MEN know that the biggest thief of production with air tools and air operated equipment is low air pressure at the tool when operating under load. This costly condition, which can exist even if air systems are new, requires constant checking to maintain correct pressure at the tools.

LOW TOOL PRESSURE can result from inadequate piping, leakage or an overworked compressor . . . To find out quickly if you are getting full production from your air tools and equipment, ask today for a brief survey by a qualified I-R AIRengineer. You'll find one at your nearest Ingersoll-Rand Branch Office or authorized I-R distributor.

Ingersoll-Rand
11 Broadway, New York 4, N. Y.



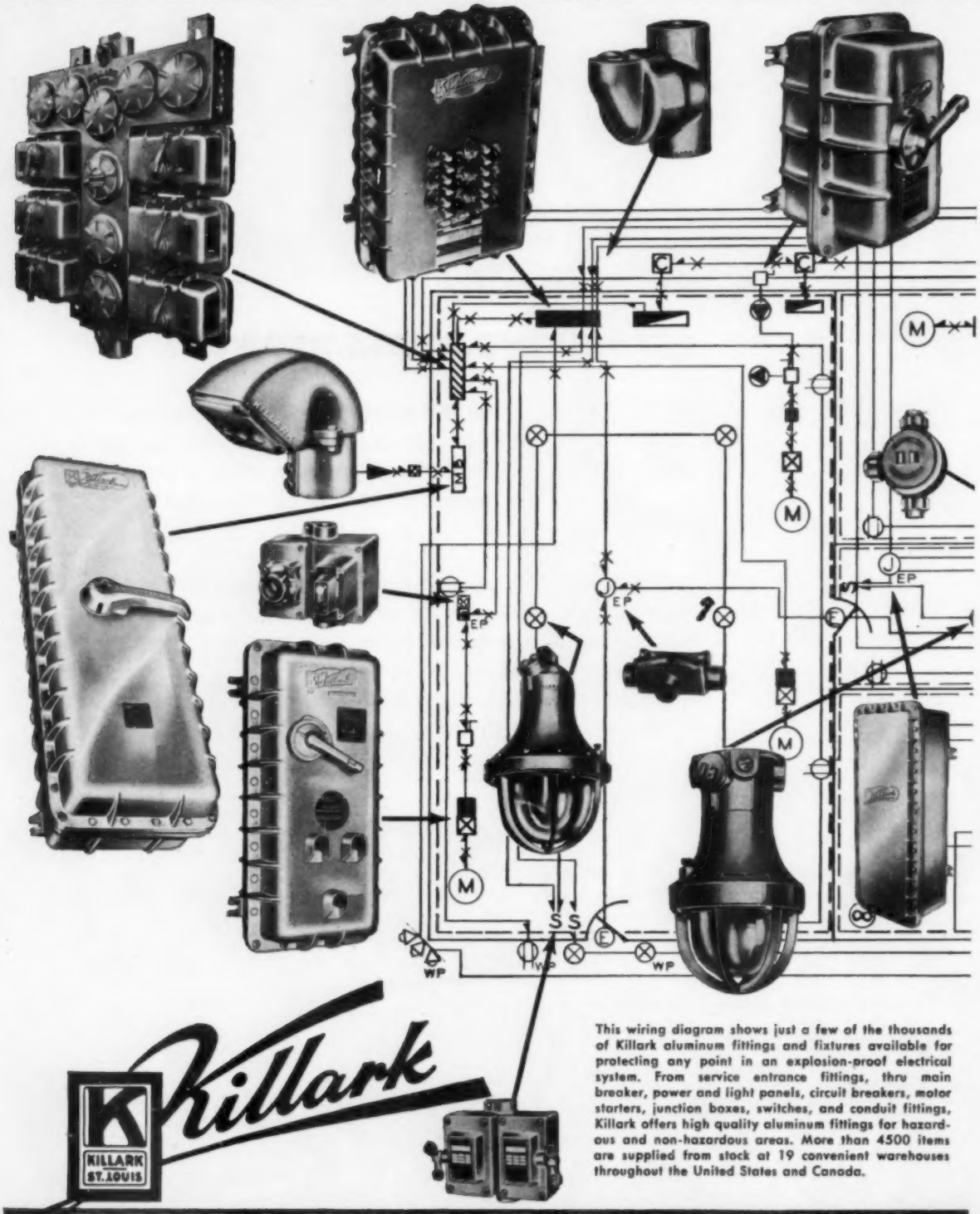
Ingersoll-Rand Type 30
Air-Cooled Air Compressor
½ through 20 hp

114A3

For more facts circle 513 on Reply Card

For more facts circle 512 on Reply Card

Killark supplies all the explosion



This wiring diagram shows just a few of the thousands of Killark aluminum fittings and fixtures available for protecting any point in an explosion-proof electrical system. From service entrance fittings, thru main breaker, power and light panels, circuit breakers, motor starters, junction boxes, switches, and conduit fittings, Killark offers high quality aluminum fittings for hazardous and non-hazardous areas. More than 4500 items are supplied from stock at 19 convenient warehouses throughout the United States and Canada.

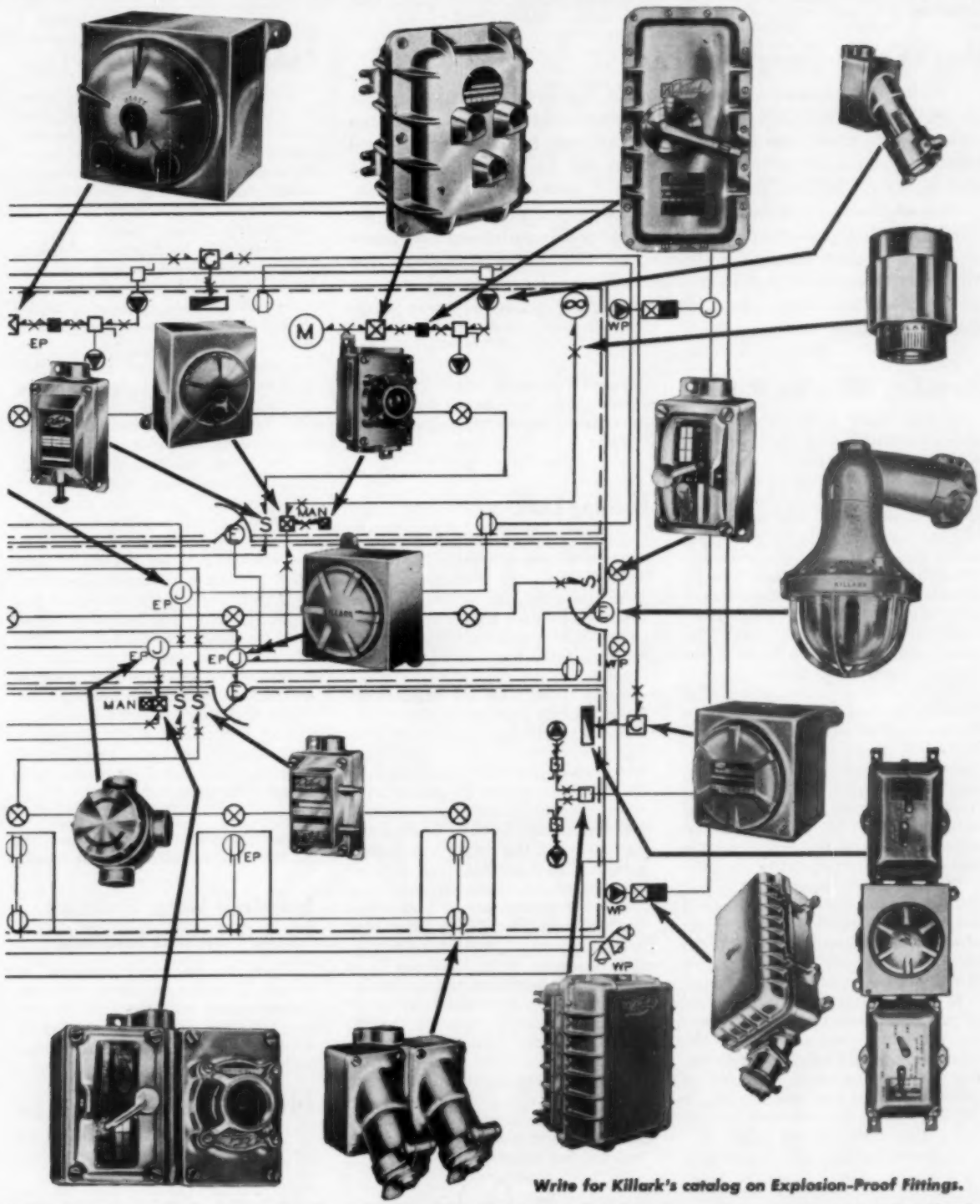
Killark

K KILLARK ST. LOUIS

ELECTRIC MANUFACTURING COMPANY

VANDEVENTER AND EASTON AVE. • ST. LOUIS 13, MO.

- proof equipment you need...



Write for Killark's catalog on Explosion-Proof Fittings.

SOLD THROUGH LEADING DISTRIBUTORS' WAREHOUSE STOCKS IN NINETEEN CITIES

For more facts circle 514 on Reply Card

Hall Industrial Water Report

VOLUME 8 MAY 1960 NUMBER 1

Don't Carry Things Too Far

This familiar expression predicts trouble. Just as trouble with deposits comes when steam carries droplets of boiler water too far—out of the boiler steam drum into superheaters, turbines, heat exchangers and heating systems. Superheater tubes burn out, turbines lose efficiency and capacity, and heat transfer suffers.

Hall engineers know how to combat carryover problems. They are familiar with the mechanical methods of purifying steam and know how to determine whether antifoams are also needed. They can help you to improve steam quality just as they can serve you on other water problems in the steam plant, or in cooling process or waste water disposal facilities.

Spreading Oil on the Water

At a southern synthetic fiber mill serious fouling of a turbine with water-soluble deposits required washing at intervals of approximately three months. This puzzled Hall engineer T. A. McConomy no end because normally his checks on steam showed it to be of good quality. Furthermore, he could find no place in the mill where the condensate, makeup water or boiler feedwater was being contaminated. The use of antifoams in the boiler water did not improve conditions.

One day heavy carryover occurred —so heavy that steam temperature temporarily dropped almost 100°F. The alert operators collected samples of boiler water. Analysis showed one to contain 28 ppm of ether-extractable material and the other an astounding 1185 ppm. Infrared analysis showed the ether-soluble material to be largely lubricating oil.

What was the source of the oil? Previous investigation had ruled out the mill. McConomy asked the operators to keep a careful watch on the river water at the plant intake. A few days later an oil slick showed up.

It was now easy to trace the source of contamination upstream to several service stations and small manufacturing plants which were dumping oil into the river. The job of getting them to stop was harder. So the filter plant operator now has an extra duty called "river watching." This makes possible the diversion of oil-contaminated water from the steam plant, and saves the cost of additional, expensive equipment.

Baffling Leaks

Carryover was so bad in a midwestern automobile body plant that steam traps were continually plugging and a turbine-driven air compressor couldn't produce at rated capacity. It was determined that one boiler of three was causing all of the trouble.

Each boiler was put through its paces while steam quality was checked conductometrically by Hall engineer L. P. Dougherty. Steam from two of the boilers was found to be excellent under all conditions, even when operated at ratings well above normal. The third boiler acted all right until the rating was pushed a little above normal, then gobs of water went out in the steam.

Having proved which boiler was the bad actor, Dougherty asked that it be taken out of service for inspection of steam drum internals. Sure enough, the baffles were found to be hanging loosely, leaving spaces where steam could short-circuit to the offtakes without following the designed path.

Baffles were tightened and the leaks closed up. Additional steam purity checks showed that the repairs were effective. Trouble stopped and has not recurred.

Embrittlement in Steam Line

Failure of steam lines due to caustic embrittlement is almost unheard of. It can occur, however, if the necessary conditions are present. Caustic soda must get into superheated steam to produce a concentrated solution and this solution must contact highly stressed metal.

In one case high-pressure steam was reduced to 60 psi and desuperheated to within 40°F of saturation temperature. Desuperheating water was a mixture of condensate and deionized water. The pH value of the deionized water was adjusted to 9.0-10.0 with caustic soda for protecting uncoated steel pipe from corrosion and for establishing desired alkalinity in the boiler water.

The steam line was welded. Chill rings had been used and there were open spaces between the rings and the internal surface of the line. When desuperheating water was trapped in the spaces, it concentrated to produce a strong caustic solution in contact with the stressed metal in the welds. Cracking and failure occurred.

In this instance the major source of caustic soda was that added to the deionized water. However, sodium leakage or insufficient rinsing after anion exchanger regeneration could supply the caustic soda. Obviously then, deionizers must be operated with this in mind if the water is to be used for desuperheating.

Water is your industry's most important raw material. Use it wisely.

Industrial Water Problems Require Special Handling

There are no "stock answers" to industrial water problems. For information on how the Hall System can help you solve your particular water problems, write, wire or call address below.

HALL LABORATORIES
HAGAN BUILDING, PITTSBURGH 30, PA.
Consultants on Procurement, Treatment, Use and Disposal of Industrial Water

DIVISION OF **HAGAN** CHEMICALS & CONTROLS, INC

For more facts circle 515 on Reply Card

BULLETINS just released and of immediate plant interest

MATERIALS HANDLING

101 Overhead Conveyor Systems—Features and advantages of overhead conveyors are detailed in this 24-pp engineering manual. Covers type and construction of the power overhead, inverted overhead, piggy-back, and power and free types. Suggests over 40 applications for these conveyors; explains how to compute power requirements; layout, install and maintain overhead conveyor systems. Econ-O-Veyor Corp.

102 For Overhead Handling—Illustrated and described in 8-pp Bulletin PU-50-U is a line of overhead handling equipment, including hand chain hoists, electric hoists, cranes and trolleys. Capacity tables are included. Chisholm-Moore Hoist Div., Columbus McKinnon Chain Corp.

103 Motor Driven Cranes—Twelve-pp Bulletin 4-B illustrates and describes single girder motor driven cranes for a variety of industrial applications. Tables of dimensions are included, as well as drawings, photos and diagrams showing details of operation. Abell-Howe Co.

104 Jib Cranes—Illustrated and described in this 8-pp bulletin are jib cranes designed for low-cost spot-handling of materials and equipment. Features and typical applications are detailed and tables of capacities and other data included. Abell-Howe Co.

105 Screw Conveyor—Engineering and specification data for screw conveyor installations is presented in 60-pp Catalog Section 200-C. Includes detailed selection data, listings of screw conveyor components and accessories, sizes and dimensions, and gives formulas, tables of horsepower factors and conveyor speeds and other data needed for engineering and selection. Fort Worth Steel & Machinery Co.

106 Data on Conveyor Idlers—Details of construction, comparison of competitive designs, and selection data on belt conveyor idlers are presented in 48-pp Bulletin 171. Illustrates and describes basic types of idlers in all types of service, and includes procedure and examples, engineering tables, dimensions and specifications Hewitt-Robins, Inc.

107 Belt Conveyor Idler—Presented in 20-pp Bulletin LD-111 is a belt conveyor idler consisting of Neoprene discs molded to a Neoprene-covered, flexible steel wire cable suspended from two end-mounted bearings. Contains specifications, description of construction features, installation photos, and application instructions. Joy Mfg. Co.

108 How Much for Trucks—With the aid of the handy calculator in this 12-pp brochure you can estimate, in minutes, the costs incurred by industrial trucks. Complete details on how to calculate the cost of owning and operating industrial trucks, covering depreciation, operation, and maintenance for both gasoline-powered and battery-powered trucks, are included. Lead Industries Association.

109 Narrow-Aisle Fork Lift—Illustrated and described in this 18-pp booklet is a narrow-aisle fork lift truck which also performs as a conventional lift truck. Space-saving advantages are detailed, as well as design and operation features, hydraulic control, and power factors. Towmotor Corp.

110 Outdoor Trucks—Specifications on two gas powered fork trucks for outside handling jobs are given in 8-pp Bulletin SS-1971. Contains dimensional and engineering data on two models which have capacities of 18,000 and 20,000 lb. A discussion of power train arrangement is included. Clark Equipment Co.

111 To Survey Sling Chain—How a sling chain survey can be used to assure safe, dependable sling chain assemblies and reduce overall cost of material handling operations is explained in this 8-pp booklet. Tells how a sling chain survey is conducted. Campbell Chain Co.

112 Industrial Casters—Form 8159 includes illustrations, descriptions and specifications of 24 series of swivel-plate and rigid-plate truck casters ranging in applications from light to super-heavy duty. Floor truck locks are shown and described. Eight types of wheels available are pictured. Faultless Caster Corp.

VALVES, PIPING, FITTINGS

113 Corrosion-Resistant Valves—This 8-pp guide lists relative ability of metals, plastics and synthetic rubbers used in Flo-Ball valves to resist corrosive effects of 390 fluids encountered in industry. The tabulation permits a rapid estimate of the effects of these fluids on selected materials of constructions—aluminum, carbon steel, semi-steel and 316 stainless; Buna N, Neoprene, and Viton A; Teflon, nylon and Kel-F. Hydromatics, Inc.

114 Butterfly Valves—Resilient-seated type butterfly valves for applications where positive tight closure is required are illustrated and described in Bulletin 590X. Advantages and outstanding features are detailed. W. S. Rockwell Co.

115 Diaphragm Control Valves—Sliding gate diaphragm control valves designed for instrumented process systems requiring linear flow characteristics and tight shut off are illustrated and described in 8-pp Bulletin J-170. Cutaway views showing component features are included, as well as tables of dimensions and recommended capacities. OPW-Jordan.

116 For Fluid Flow—Eight-pp Bulletin 5911251 describes valves for fluid flow and condition control. Details such design and selection factors as function, application, and method of actuation, and gives engineering data, characteristics, range specifications and illustrates various types of valves. United Aircraft Products, Inc.

117 Glass Reinforced Pipe—Bulletin FRP-1 describes properties and advantages of glass reinforced plastic pipe for chemical corrosion control. A corrosion table showing chemical resistance of materials to various chemicals is included. Haveg Industries, Inc.

118 Expansion Joints—Six-pp Bulletin 850 contains detailed information on rubber expansion joints and flexible pipe for use in pressure and vacuum lines. Applications and advantages are detailed, and table of dimensions, and pressure and movement limitations included. General Rubber Corp.

INSULATION

119 Pipe-Fitting Insulation—Design features and advantages of molded fiber glass pipe fitting insulation are detailed in Bulletin TD-105. Specifications and table of dimensional data included. Fibrous Glass Products, Inc.

120 For Underground Piping—Advantages and characteristics of Insul-Fil, an insulation for underground steam lines, given in eight data sheets. Application details are illustrated and described and complete specifications included, as well as engineering drawings and graphs on heat loss. Insul-Fil Co., Inc.

On pages 295-296 are two postage-free Reader Service Cards provided for your convenience in ordering these bulletins. You may also use the cards to order any literature mentioned in ads.

MECHANICAL POWER TRANSMISSION

121 Controlled Speed Systems—Illustrated with schematic drawings and application photos, this 8-pp bulletin explains company's controlled speed system principle which provides adjustable speeds by converting fixed-speed a-c motors to adjustable speeds on either existing or new equipment. Advantages and typical applications for system are detailed. U. S. Electrical Motors Inc.

BULLETINS

(Begins on page 25)

122 Magnetic Drives—Performance data on magnetic drives designed to provide overload protection even under extended full stall are presented in 12-pp Bulletin TP 1-60. Drive features are described, typical application illustrated, and engineering selection detailed. Tormag Products, Div., Gleason Reel Corp.

123 Industrial V-Belts—This 64-pp industrial catalog on BostRon V-belts contains pre-engineered data tables for greater convenience. In addition to general information, V-belt drive selection tables, horsepower rating tables and matching data, and other product information included. The Boston Woven Hose & Rubber Co., Div. American Biltrite Rubber Co.

124 Variable Pitch Sheaves—Eight-pp Bulletin SL-101-A illustrates and describes spring-loaded and manually-controlled type variable pitch sheaves and adjustable motor bases. In addition to specifications, it contains tables of practical stock drive combinations for convenient selection. Browning Mfg. Co.

125 Motor Couplings—Geared flexible motor couplings featuring corrosive duty covers are illustrated and described in Folder 2875. Specifications and dimensions, and selection information included. Link-Belt Co.

126 On Aluminum Bearings—"Alcoa Aluminum Bearings," 80 pp, presents a recent and extensive collection of case histories, engineering and test data pertaining to sleeve bearings and bushings of aluminum. The art and science of designing bushings—from the miniature to the gigantic 4-ft diam units—is discussed. Ten case histories, detailing both common and exceptional applications, preface the sections of engineering data. Liberal use is made of charts, graphs, drawings and photos in the technical sections. Book is available to qualified plant engineers. Aluminum Co. of America.

PACKINGS, GASKETS, SEALS

128 Packings, Gaskets—Palmetto gasketing and gaskets for flanges, joints, boilers manholes, furnace doors and similar applications are described and illustrated in 12-pp Catalog GG-1259. Sectionalized for easy reference, catalog presents 14 types of sheet packings; compressed asbestos ring and full face gaskets; wire inserted folded asbestos gaskets; six types of tape, rope, lagging and wick packings. Provides details on composition, temperature limits and intended services, sizes, prices. Greene, Tweed & Co.

129 Diaphragm Seals—Bulletin 250 describes diaphragm seals for protection of pressure instruments against corrosion and clogging. Contains full description, specifications and prices on various models in the line. Brooks Rotameter Co.

130 Metallic O-Rings—Advantages of self-energized metallic O-rings designed to meet extreme conditions of temperature, pressure and corrosion are detailed in 30-pp Bulletin 596191A. Illustrates and describes applications, sealing characteristics, and includes recommendations for correct use, and tables of dimensions. United Aircraft Products, Inc.

ELECTRICAL

131 Resilient-Mounted Motors—Bulletin MU-245 describes a line of ultra-quiet resilient mounted motors. Features and advantages are detailed, three types of motors described, and details on mounting construction are included. Wagner Electric Corp.

132 Pump Motors—Bulletin MU-244 describes doubly-protected, dripproof and totally-enclosed polyphase squirrel-cage motors for close-coupled centrifugal pump applications. Electrical and mechanical features are shown on cutaway view and dimensional data table included. Wagner Electric Corp.

133 Submersible Pump Motors—Eight-pp Bulletin F-2000 contains full-length cutaway drawings showing construction details, features of submersible motors for 6-, 10- and 14-in. well diameters and explains their water-filled operating principle. Also presents exploded and assembled views of the motors' thrust bearing. Explains how motors' windings are hermetically sealed in stainless steel; how water circulation cools the motor and lubricates its bearings. Includes ratings. U. S. Electrical Motors Inc.

134 L-V Distribution Equipment—Now available, the 84-pp, 1960 Buy Log covers low-voltage distribution equipment. It serves as a condensed buying catalog for service entrance equipment, light and heavy duty safety switches, tumble and open-knife switches, hinged wireway, circuit breakers, switchboards, motor control centers, sectional distribution centers, panelboards and busway. Among features provided in this easy-to-use catalog are selector charts, pictorial descriptions, consolidated pricing tables. Also included are ratings, weights, dimensions, standard quantities. General Electric Co.

135 Magnetic Motor Controls—Six-pp Form A-262 describes design principle and operating features of company's magnetic motor controls. Typical applications showing how units are packing more control into less space are covered. Arrow-Hart & Hegeman Electric Co.

136 Electrical Equipment Guide—Describing heavy duty electrical transmission and distribution equipment for commercial, industrial and other installations, this 300-pp catalog digest contains detailed specifications. Presents interrupter switches, medium voltage switchboards, unit substations, power centers, low voltage switchgear, panel type switchgear, bus ducts, bus plugs, motor control centers, panel boards, circuit breakers, safety switches, instrument and control boards. An "easy estimator" is included in each section. Available to qualified plant engineers. Continental Electric Equipment Co.

137 Contactors, Starters—Twenty-pp Bulletin GEA-7020 contains information on magnetic contactors and starters including combination, reversing and two-speed forms, and modification kits available. Gives application, installation and maintenance information along with product features. Construction details, including photos and description of subassemblies, are pointed out. General Electric Co.

138 Magnetic Starters—Design and construction features of company's a-c magnetic starters are detailed in 8-pp Bulletin PL 12-8-160. Describes arc quenching principle which provides greater contact life under heavy current loads and severe arcing conditions. The Clark Controller Co.

139 Guide to Relays—Illustrated Bulletin 7021, 12 pp, discusses relays for all applications. Relays included are general purpose, machine tool, mechanically held (latched-in), pneumatic time-delay and synchronous motor-driven timing. Brochure contains relay descriptions and application and installation details as well as dimensions, ratings and ordering information. General Electric Co.

Postage-free Reader Service Cards make it easy to order bulletins. Cards are provided on pages 295 and 296.

140 Relay Data—Using photos, line drawings, tables and descriptive material, this 42-pp manual presents detailed data on pile-up relay types, variations in spring arrangement, timing, coil voltage, contact ratings and other useful classifications. Tables give complete relay data. Diaphlex Div., Cook Electric Co.

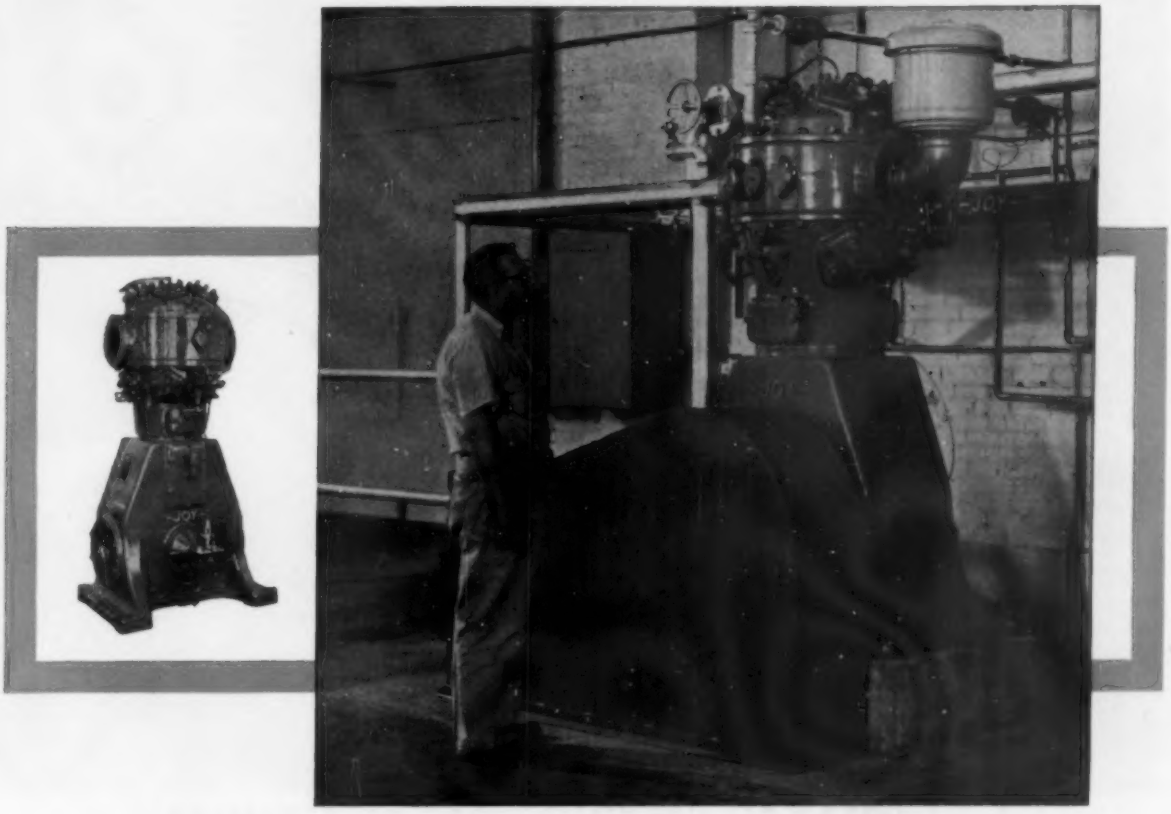
141 Strongbox Solenoids—Twelve-pp Bulletin GEA-6215B describes features and advantages of company's industrial strongbox solenoids, including a-c and d-c forms. Describes uses of solenoids, and includes selection information for both push- and pull-type solenoids, with force and current curves shown to aid in selection. General Electric Co.

142 Testing Instruments—Twelve-pp Bulletin 19-60 contains descriptive information on company's line of instruments for industry, including electrical resistance testers, dielectric test sets, cable fault locating equipment, turn ratio test sets, others. Advantages detailed. James G. Biddle Co.

(More Bulletins on page 297)

Now Available Up To 150 HP

NEW JOY WG9H VERTICAL COMPRESSORS



Joy's line of highly efficient vertical type compressors has been extended to 150 hp. These new heavy duty WG9H's have the same design features which established the vertical type, single-cylinder compressor's reputation for high efficiency and low maintenance.

You can get both standard and oil-free machines in six standard atmospheric air sizes, with appropriate cylinders for gas boosting and high pressure applications, if desired. Capacity range is from 633 to 1630 cfm.

Other Joy vertical type compressors are available in a range from 15 to 75 hp. Joy also can furnish V-type and semi-radial type machines up to 1250 hp, and axial or centrifugal compressors from 15 to 15,000 hp. Whatever your air or gas compressing problems may be, Joy can supply an economical solution.

For full information on the new line of WG9H Compressors, write for Bulletin 1013-15.

AIR MOVING EQUIPMENT FOR ALL INDUSTRY

JOY

Joy Manufacturing Company
Oliver Building, Pittsburgh 22, Pa.

In Canada: Joy Manufacturing Company (Canada) Limited, Galt, Ontario

For more facts circle 516 on Reply Card

MOYNO®
PUMPS

Let MOYNO'S® *"Progressing Cavities"* Cut your Pump Maintenance Costs!

MOYNO's unique *"progressing cavity"* principle cuts pump maintenance costs because material being moved contacts only one moving element. MOYNOS are constructed to stoutly resist corrosion and abrasion. As shown in the cutaway model above, MOYNO's screw-like rotor revolves in a double-threaded stator forming *"progressing cavities"* that move material smoothly along, without foaming, aerating or crushing. Even where duty is so torturous that rotor and stator must be made of special resistant materials, MOYNO parts show little wear.

In industry everywhere, and on OEM applications, MOYNOS are proving "if it can be pushed through a pipe . . . MOYNO will pump it!" Typical materials pumped include non-pourable pastes, abrasive slurries, chemicals, foods, acids, even suspended solids up to one inch in size. Many materials now successfully pumped by MOYNO were once considered "unpumpable" . . . had run up prohibitive maintenance costs on other type pumps or ruined them completely.

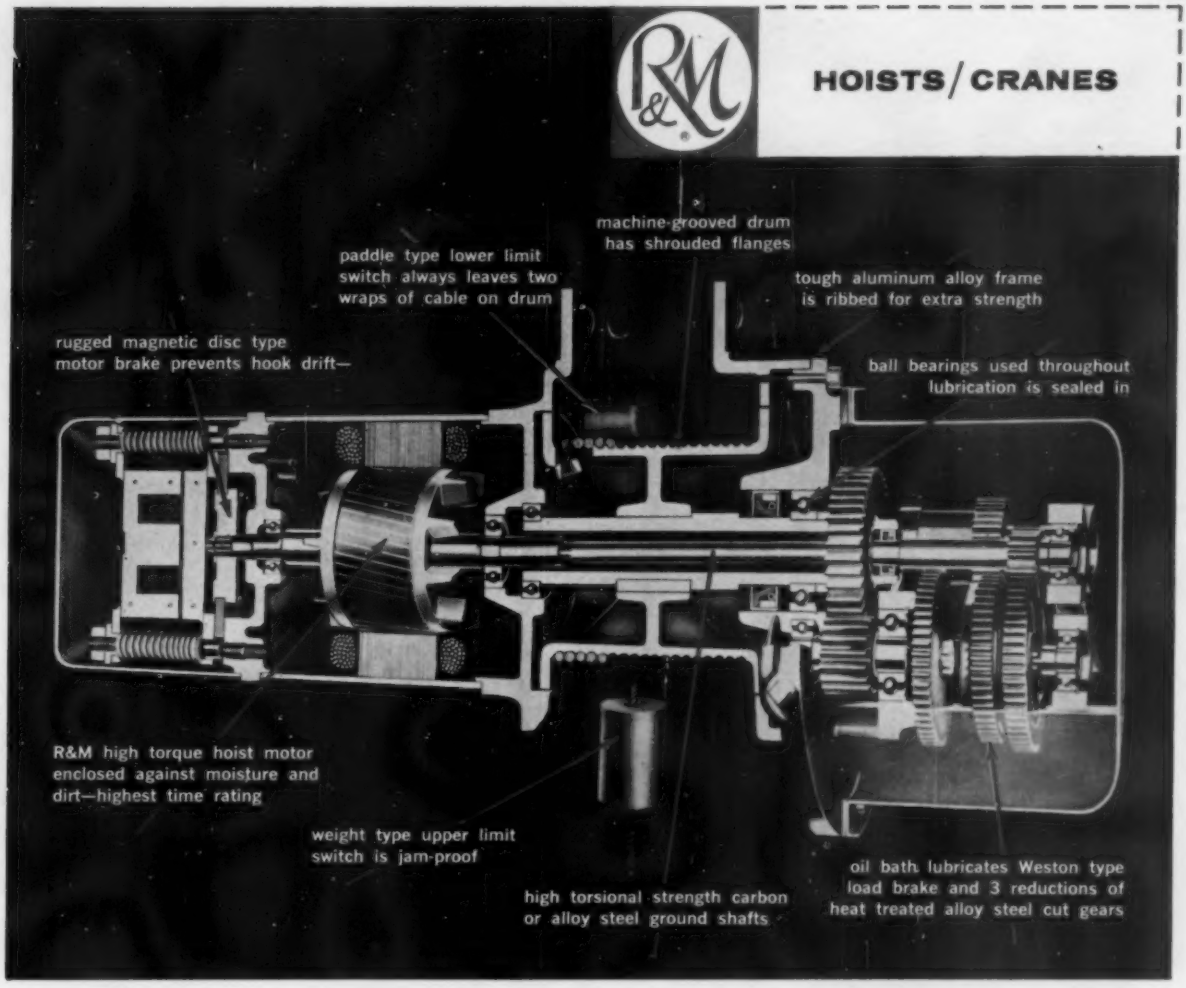
Capacities are available up to 500 gpm and pressures up to 1000 psi. Off-the-shelf replacement parts are always immediately available. No doubt your plant flowsheet or OEM product has a spot where MOYNOS can cut costs drastically. To find out how, write today for Bulletin 30-PE!

ROBBINS & MYERS, INC.

motors, household fans, Propellair industrial fans, hoists, Moyno industrial pumps

SPRINGFIELD, OHIO · BRANTFORD, ONTARIO

For more facts circle 517 on Reply Card


R&M
HOISTS/CRANES
machine-grooved drum has shrouded flanges
paddle type lower limit switch always leaves two wraps of cable on drum
tough aluminum alloy frame is ribbed for extra strength
rugged magnetic disc type motor brake prevents hook drift—
ball bearings used throughout lubrication is sealed in
R&M high torque hoist motor enclosed against moisture and dirt—highest time rating
weight type upper limit switch is jam-proof
high torsional strength carbon or alloy steel ground shafts
oil bath lubricates Weston type load brake and 3 reductions of heat treated alloy steel cut gears

HOIST VALUE WHERE YOU NEED IT

Robbins & Myers Type J hoists can go to work for you this week. Since they are stocked near you, it's no trick at all to see—and benefit from R&M's superb design advantages. They give value beyond competitive price: *because* no other hoist has a higher rated, better protected motor (30 minute, 55° C. rise), *because* you get two brakes—a disc type motor brake and a Weston type load brake, *because* you get upper and lower non-jamming limit switches. Ball bearings are used throughout and the three reductions of heat treated alloy steel gears are lubricated in a sealed bath. Capacities—¼, ½, 1 and 2 tons; mounting—lug is standard, push, hand geared and motorized trolleys are available. Voltage is reduced at the push-buttons; control is magnetic. Request Bulletin 905 from the Hoist & Crane Division of Robbins & Myers, Inc., Springfield, Ohio or Brantford, Ontario.

Type J hoists: seven bonus-packed models.

ROBBINS & MYERS

hoists & cranes, Moyno® pumps, motors, Propellair® fans

For more facts circle 518 on Reply Card

Light as ALL Outdoors...

NEW SKYLIGHTS

Fresh as ALL Outdoors...

NEW VENTILATED

Exclusive, from JENN-AIR

- **ILLUMINATION** . . . clear Astro-Lite domes transmit 92% of available light . . . translucent domes transmit up to 75% of available light . . . excellent light diffusion qualities
- **STRENGTH** . . . one-piece acrylic resin domes . . . less than half the weight of glass with far greater impact resistance . . . heliarc welding of extruded aluminum frame corners add strength, durability
- **WEATHERPROOF** . . . all units are designed to insure against water leakage
- **INSULATION** . . . optional double dome Astro-Lite units eliminate condensation, maintain temperature balance . . . acrylic domes offer 20% more insulation than glass
- **VERSATILITY** . . . the widest range of skylight-power ventilator combinations . . . 1350 variations
- **PERFORMANCE** . . . extra power for commercial, institutional and industrial applications . . . ventilator capacities to 4400 cubic feet per minute
- **SILENCE** . . . unequalled noise supression meets hospital, classroom, library requirements . . . eliminates ductwork . . . every unit quiet-tested
- **BEAUTY** . . . lowest silhouette of any roof ventilating system . . . handsome exhauster housing harmonizes with Astro-Lite dome contours
- **ECONOMY** . . . easy, economical installation . . . permanent, maintenance-free construction . . . *single manufacturer responsibility.*

JENN-AIR LEADS IN FUNCTIONAL IMAGINEERING

JENN-AIR

JENN-AIR PRODUCTS COMPANY, INC.

SKYLIGHTS

JENN-AIR

Astro-Vent
VENTILATED SKYLIGHTS

ASTRO-VENT
Series E, single light, single vent

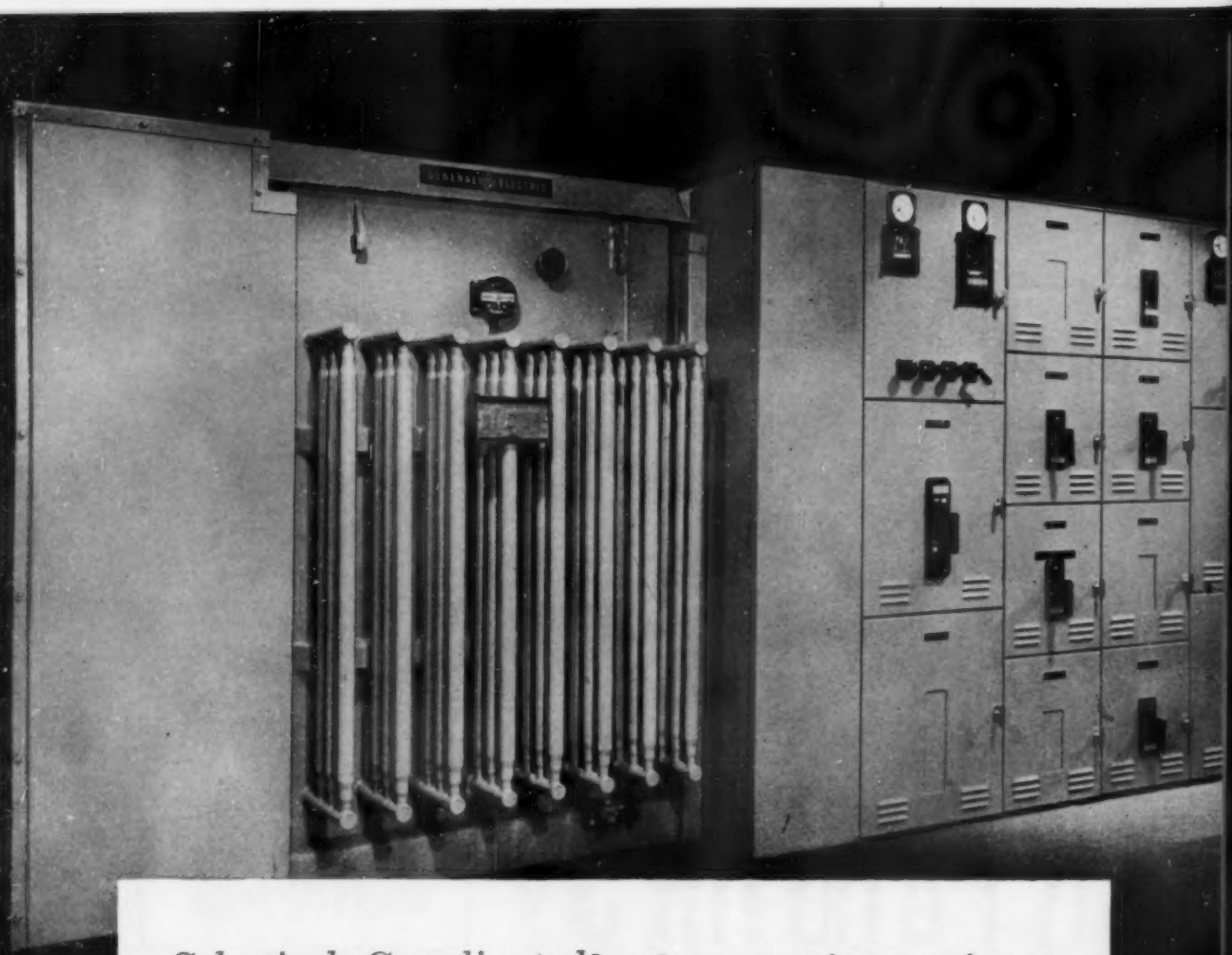
ASTRO-VENT
Series F, single light, double vent

ASTRO-VENT
Series G, double light, single vent

For the unique new approach to natural lighting . . . plus high-capacity, low-noise-level power ventilation . . . in virtually any combination . . . it's Jenn-Air. Write for Bulletin 60-LV.

1102 STADIUM DRIVE, INDIANAPOLIS 7, INDIANA

For more facts circle 519 on Reply Card



Selectively Coordinated **load centers give maximum service continuity . . . and now cost you less**

1. SAVE UP TO $600 PER BREAKER because General Electric has eliminated the price premium for selective trips when supplied with G-E switchgear equipments.

2. SAVE UP TO $630 PER BREAKER by using manually operated, stored-energy breakers in place of electrical units formerly required.

Total savings vary from $465 to $930 per breaker, depending on size.

How much can you save? Ask your General Electric sales engineer.

General Electric *Selectively Coordinated* Load Center Unit Substations now are . . .

Yours at Lower Cost

YOU NOW PAY LESS

You can purchase G-E *Selectively Coordinated* load center unit substations at new low prices. General Electric has eliminated the price premium normally charged for this inherently higher-cost, more highly-engineered product. This means that you can now get superior service for the same price as the more common, but less "intelligent," fully-rated load center unit substation. Further savings can be realized by the use of manually operated stored-energy breakers.

SELECTIVELY COORDINATED LOAD CENTERS MINIMIZE DOWNTIME

In the *Selectively Coordinated* load center, the tripping times of the main and feeder breakers are coordinated so that during short-circuit conditions, power is removed only from the faulted feeder. Power continues to flow to the unfaulted feeders—thus preventing costly, unnecessary downtime. (See diagram below.)

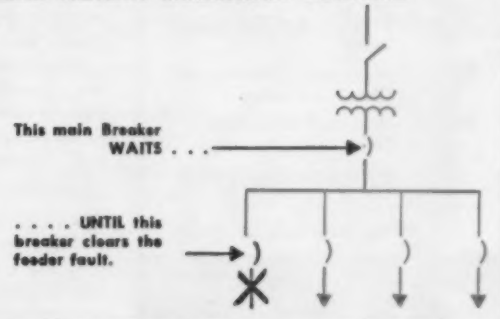
SIMPLY SPECIFY SELECTIVE COORDINATION

Order the *Selectively Coordinated* load center. Upon delivery, you will receive time-coordination curves which show you the factory-preset characteristics of each breaker, how they combine to assure you of the best possible service continuity.

For more detailed information, contact your nearest G-E Apparatus Sales Office or write to General Electric Co., Schenectady 5, N. Y. for bulletin GEA-3592. 331-01

HOW Selective Coordination PREVENTS UNNECESSARY DOWNTIME

WITH G-E SELECTIVELY COORDINATED load center unit substations, feeder breakers are adjusted to clear any magnitude of feeder fault. The selective main breaker preserves power continuity to unfaulted feeders.



Progress Is Our Most Important Product

GENERAL ELECTRIC

For more facts circle 520 on Reply Card

FILLED TEFLON* BEARINGS

Chempro Filled-Teflon Bearings are tougher, harder, more wear-resistant and less subject to thermal expansion with the addition of specific filter compounds to virgin Teflon. Ideal for pumps, mixers, reactors and similar equipment where a chemically inert, non-corrosive, non-contaminating and non-adhering bearing material is a must.

Chemical & Power Products offers a complete Filled-Teflon Bearing service, including Chempro Finished Bearings either Pressed in Housings or without Housings, or Chempro Filled-Teflon Molded Tubes for machining bearings in your shop. Complete machining instructions furnished.

CHEMPRO FILLED TEFLON STYLES

FM-2	Glass-Filled Teflon
FM-3	Carbon-Filled Teflon
FM-4	Glass and Carbon-Filled Teflon
FM-8	Graphite- and Zircon-Filled Teflon
FM-9	Molybdenum Disulfide and Glass-Filled Teflon
FM-10	Mica- and Glass-Filled Teflon

Write for Bulletin CP-558.

*duPont trademark

CHEMICAL & POWER PRODUCTS, Inc.

7 Broadway, New York 4, N.Y.

For more facts circle 521 on Reply Card

BACKTALK AND FORETHOUGHTS

Edited by Marjorie E. Weissman

More Precious than Rubies . . .

PLANT ENGINEERING:

"In going through this month's copy of PLANT ENGINEERING, we removed the Construction Cost Estimating, Part 7, for filing, but found that our preceding months had disappeared from our files.

"Would it be possible for you to send us these back parts, 1-6, so that our file will be complete?

"We will lock them up.

"We will expect you to bill us for them." *P. J. Kennedy, Jr., P. J. Kennedy & Co., Engineers, Holyoke, Mass.*

▶ Happy to replace the missing tear sheets, with our compliments. We dread to think what would happen to anyone who loses the key to that file cabinet, though.—*Editors.*

"Hard-Hitting P.M. Articles"

PLANT ENGINEERING:

"I would be most appreciative of having all the available sections of 'Construction Cost Estimating' for my file. I believe that the January, 1960 issue contained section 8.

"Your January issue contained excellent articles covering ways and means to maintenance improvement. If you have any other hard-hitting articles on P.M. that might be of value in selling management on this vital function, copies of same would be gratefully received." *Andrew R. Herbanek, Industrial Engineer, Weyerhaeuser Co., Plymouth, N. C.*

PLANT ENGINEERING

"Would you kindly advise me of the cost of the complete series of 'Construction Cost Estimating' as published in PLANT ENGINEERING. I understand that this series will be prepared in pamphlet form upon completion and made available.

"We would be interested in a quantity of six at this time and possibly a larger quantity if the pamphlet is found suitable for field use." *Harold Hill, Engineering Division, Continental Baking Co., Inc., Rye, New York.*

PLANT ENGINEERING:

"We are interested in your booklet covering a new series on construction cost estimating. When this booklet is printed, please reserve three copies. The booklet is something that will fill a much needed requirement in our planning. Thanking you in advance for your kind assistance in this connection." *W. F. Grant, North American Aviation, Inc., Palmdale, Calif.*

▶ We have obliged on both counts, by sending a set of tear sheets of the series, to date, on "Construction Cost Estimating," and a selection of maintenance articles which we think should do the job of selling management.—*Editors.*

Central Vacuum Cleaning System

PLANT ENGINEERING:

"In your February, 1960 issue, in the article titled 'How Clean Can You Get,' page 106, I see that they have used a central vacuum system to clean up dirt.

"We have a similar problem in our finished textile fabrics plant, where we accumulate much lint during the week and, presently, our cleaning method is using compressed air.

"We are interested in investigating some type of central vacuum cleaning system. Perhaps you can advise us on the manufacturers or suppliers of this system." *Charles J. Kolar, Project Engineer, Joanna Western Mills Co., Chicago, Ill.*

Plastisols in Maintenance

PLANT ENGINEERING:

"We note in your February, 1960 issue an article entitled 'How Plastisol Coatings Can Cut Costs.' This appeared on pages 112, 113 and 114.

"We would appreciate very much receiving six copies of this particular issue, or reprints, or tear sheets, whichever is most convenient." *Milton Carlie, Sales Manager, Dennis Chemical Co., St. Louis, Mo.*

Tracking Maintenance Costs

PLANT ENGINEERING:

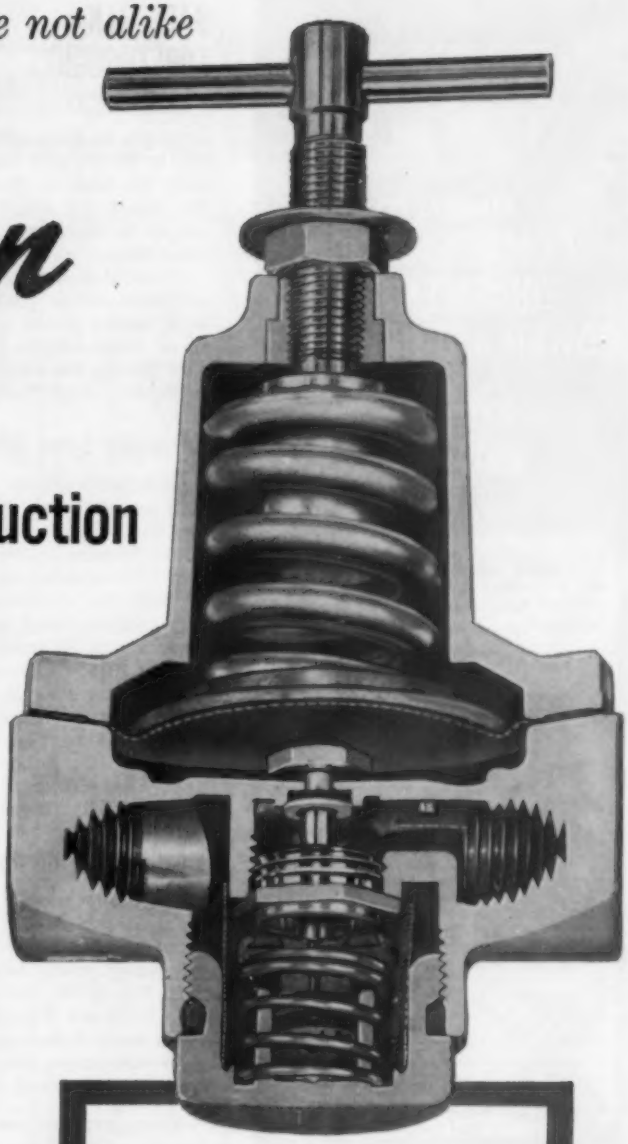
"I have read in your magazine of January, 1960, the article concerning the organization of maintenance jobs.

"We have just put a maintenance system in our plant, with one man to maintain the existing equipment, boarding machines and other automatic type equipment. Another man will do mainly building work and work on our experimental equipment.

"It is obvious to us that it is difficult to measure or keep track of the cost and efficiency of an equipment maintenance program. We are wondering about the desirability of using a card for each maintenance man such

All Pressure Regulators are not alike

Norgren



Balanced valve construction

The Norgren extra, assuring more uniform air pressure regulation

You buy an air pressure regulator for just one purpose: because you need accurately controlled pressure.

However, with any compressed air system, there are two operating conditions that, separately or together, can produce a change in the regulated pressure: 1. Fluctuations in line or supply pressure, and 2. Variations in air flow demand by your air-operated equipment.

That is why Norgren developed the balanced valve.
The balanced valve gives the Norgren Regulator an extra efficiency in compensating for changes in line pressure and changes in flow demand. As a result, the Norgren Pressure Regulator maintains the uniform delivery pressure you need, under any and all operating conditions.

Whatever your pressure regulation need, there is a Norgren Pressure Regulator designed for the job. Call your nearby Norgren Representative listed in you telephone directory—or WRITE FACTORY FOR DESCRIPTIVE LITERATURE.

FOUNDED IN 1926

C. A. NORGREN CO.

3443 SOUTH ELATI STREET • ENGLEWOOD, COLORADO

Norgren Pressure Regulators give you these important features:

- Balanced Valve Construction—Improved regulator performance
- Large Nylon-reinforced Buna N Synthetic Rubber Diaphragm—long service life
- Baffle and Siphon Tube—increased accuracy
- Large Passages and Valve Openings—large flow capacity
- Easy servicing while still on air line
- Flexible Valve Pin—assures better seating

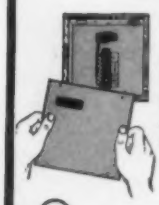
For more facts circle 522 on Reply Card

GTC

UNITIZED
COMMUNICATION EQUIPMENT for POWER and INDUSTRY

Effective! Reliable! Economical!

1 Highly effective in extremes of ambient noise and temperature.



2 Plug-in units provide ease of installation, expansion and maintenance.

3 Transistors and rugged, industrial type components used throughout.

4 Central control cabinet, costly engineering and fabrication eliminated.

Wherever a highly dependable, voice communication system for use in high noise level areas is needed—you'll find GAI-TRONICS specified by name.

GTC is extremely flexible in application. Write today for a copy of our completely illustrated, descriptive booklet and name of nearest representative.

GAI-TRONICS
CORPORATION
Dept. C
READING, PENNA.

GAI
FOUNDED 1956

A SUBSIDIARY OF
GILBERT ASSOCIATES, INC.
ENGINEERS AND CONSULTANTS

For more facts circle 523 on Reply Card

BACKTALK—FORETHOUGHTS

as might be used with a McBee system to fill out each hour he spends on each machine, so that at the end of the month we can tally up the expenses for each job and each piece of equipment.

"I would appreciate any information or forms which you might have or have access to, or possibly manuals which might help us in our program." *Jack Slane, President, Slane Hosiery Mills, Inc., High Point, N. C.*

Adjustable Speed Drive

PLANT ENGINEERING:

"I am writing in regard to the article on 'eddy-current drives' in the February issue of PLANT ENGINEERING. I am considering using this type of drive for a conveyor which runs at a constant speed approximately 16 hours a day. However, a speed range ratio of 10:1 is desired, due to production schedule changes.

"Please forward any further information and engineering data that is available." *G. Yaskanin, Plant Engineer, Fisher Body Division, General Motors Corp., Flint, Mich.*

Plastic Piping Survey

PLANT ENGINEERING:

"We would like very much to have about a dozen copies of the article on plastic piping which appears on page 123 of the December, 1959 issue of PLANT ENGINEERING. Please let us know if reprints are available." *A. W. Michalson, Illinois Water Treatment Co., Rockford, Ill.*

► Sorry, reprints are not available, but tear sheets are, and reader requests will be filled.—*Editors.*

Bulk Storage Tanks

PLANT ENGINEERING:

"Over the past years, I have been reading with interest your 'Backtalk and Forethoughts' in PLANT ENGINEERING magazine. I can see where this section provides a valuable service to your readers. Now it is my turn to request information on a subject I hope you can help me with.

"I would appreciate receiving any information you have available on the subject of bulk storage tank facilities. What are the most economical methods of construction? What are the advantages and disadvantages of round tanks versus rectangular tanks?

"Liquids to be stored in bulk are: alkyd resins, oils, fats, caustic soda, silicate of soda and petroleum oils. The capacity of these tanks would vary from 7000 gal to approximately 30,000 gal.

"Any information you can supply me with regard to the above will be greatly appreciated." *Robert E. Rodli, Engineer, John R. Wald Co., Inc., Huntingdon, Pa.*

► We have supplied Mr. Rodli with tear sheets of two or three articles which should be useful. For detailed information, we have suggested he contact manufacturers of bulk storage tanks.—*Editors.*

Zinc Oxide Recovery

PLANT ENGINEERING:

"Confronted with a problem of recovery of zinc oxide from exhaust fumes, I found an article in the July, 1957 issue of your magazine dealing with 'Microdyne—In-Line Dust Collector,' manufactured by Joy Manufacturing Co.

"I would appreciate very much if you would put me in touch with them.

"To speed up the process I am enclosing the technical data of the exhaust fan." *George Uitz, Engineering Department, Canadian Western Pipe Mills Ltd., Port Moody, B.C., Canada.*

New Files for Old

PLANT ENGINEERING:

"On pages 46 and 48 in the January, 1960 issue of PLANT ENGINEERING, you published an article entitled 'Reclaiming Files.' Would you please send me complete information on this process, equipment used, where available, etc.? I will appreciate any help you may be able to give me." *O. R. Fletcher, Machine Shop Supt., Reynolds Metals Co., Hurricane Creek, Bauxite, Ark.*

PLANT ENGINEERING:

"Recently we observed an article titled 'Reclaiming Files' in the January, 1960 issue of PLANT ENGINEERING, pages 46 and 48. The article describes an electrochemical process by which Vickers-Armstrongs Ltd., England, salvages metal files. We are very interested in the Vickers process.

"We understand that you would be able to supply us with the details or put us in touch with the people in England who can help us." *I. L. Brossman, Vehm Engineering Corp., Culver City, Calif.*

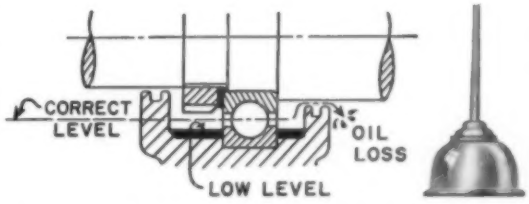
► All the information available to us on this process was given in the article referred to above. However, the Vickers-Armstrongs Company has stated that they are making details of it freely available and inquiries have been forwarded to them.—*Editors.*

DISTRIBUTOR DAN, the SKF bearing man, tells

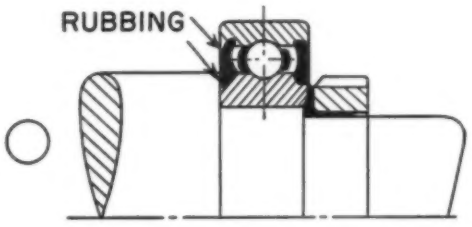
WHY BEARINGS BECOME OVERHEATED

and how to correct the conditions that cause excessive heat.

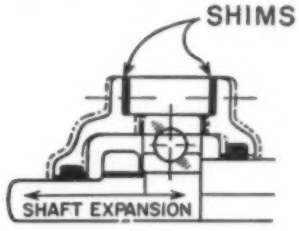
LOOK FOR THIS SYMPTOM. Discoloration of a bearing's rings, balls or rollers is a sure sign of overheating. The color is usually a gun-metal blue or bluish black.



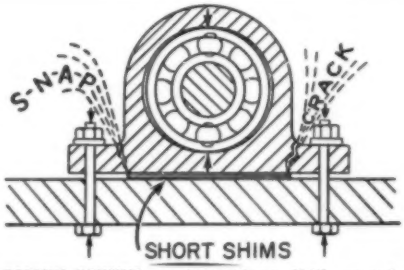
IMPROPER LUBRICATION OR LUBRICANT accounts for most cases of overheating. In pillow blocks, if oil is specified, fill only to the center of the lowest ball or roller in the bearing. If it's grease, the lower half of the pillow block should be filled. Therefore, be sure you're using the right lubricant—**in the proper quantity.**



RUBBING is a frequent culprit. Check the running clearance of the bearing seal. If it rubs against the shaft shoulder, re-machine the shoulder, to allow proper clearance. Bent lock-washer prongs are sometimes to blame. Straighten them or replace the washer.



EXTERNAL HEAT, conducted through the shaft, can make an inner ring expand excessively. It's usually the result of using a bearing with inadequate internal clearance. Make sure the replacement bearing is exactly the same as the original bearing. Should the markings be indistinct, consult an **Authorized SKF Distributor.**



THE BEARING HOUSING may be to blame—if it's warped or if the bore is distorted and out-of-round. Check to see whether the bore is pinching the bearing and relieve by scraping the bore. Make sure, too, that the pedestal surface is flat and that any shims cover the entire base area.

Baffled by a bearing problem? Whether it's selection, mounting, or maintenance—consult your Authorized SKF Distributor. He's staffed to help you keep them running smoothly and he stocks all the bearing types and sizes you need.

SKF

AUTHORIZED DISTRIBUTOR

Spherical, Cylindrical, Ball, "Tyson" Tapered and REED Miniature Bearings

EVERY TYPE—EVERY USE

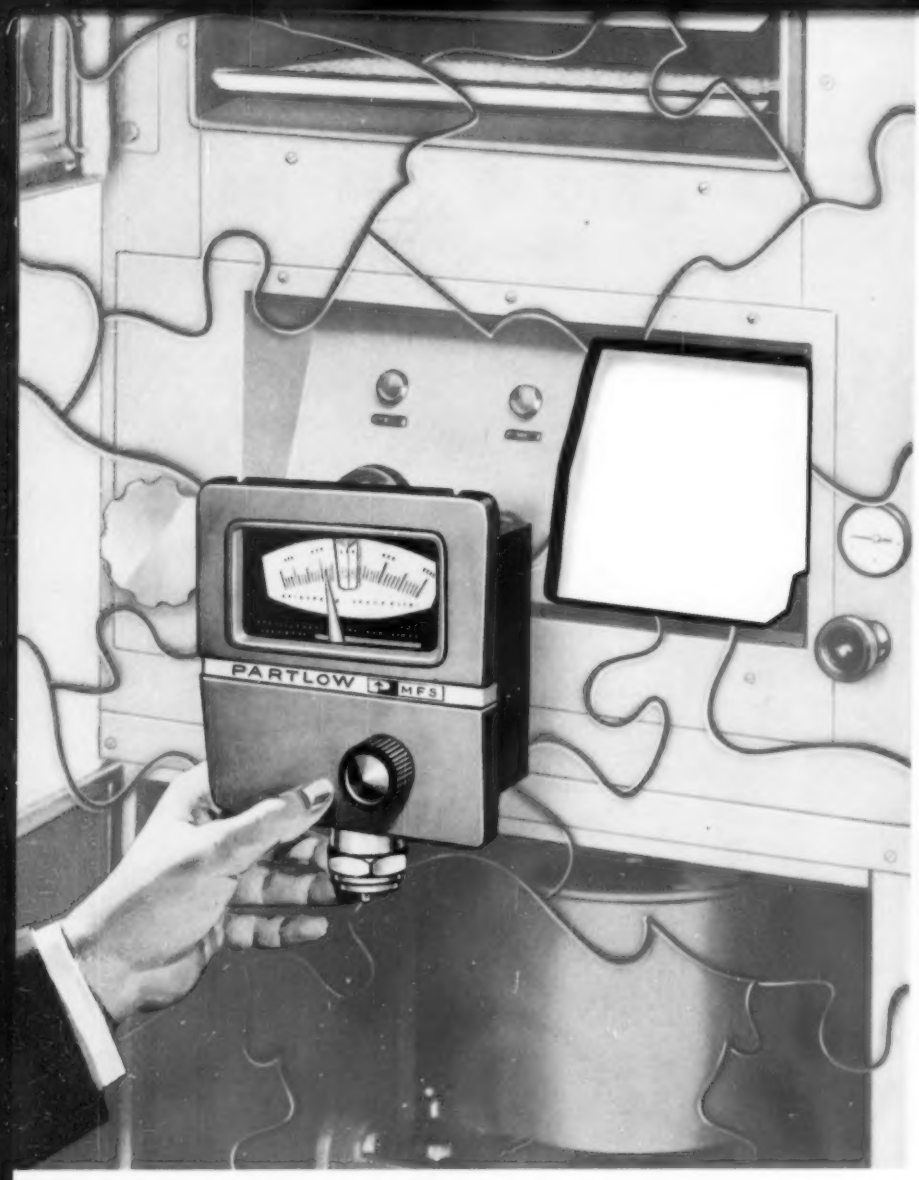
SKF®

SKF INDUSTRIES, INC., PHILADELPHIA 32, PA.

*REG. U. S. PAT. OFF.

For more facts circle 524 on Reply Card

For more facts circle 525 on Reply Card →



Partlow makes 25 different indicating control models, including the handsome, high-visibility MFS shown here.

Partlow non-indicating controls give maximum dependability at minimum cost.

A Perfect Fit for Any Temperature Control Application!

Partlow temperature controls today function in an almost infinite range of industrial processes . . . Economically. Accurately. *Precisely!*

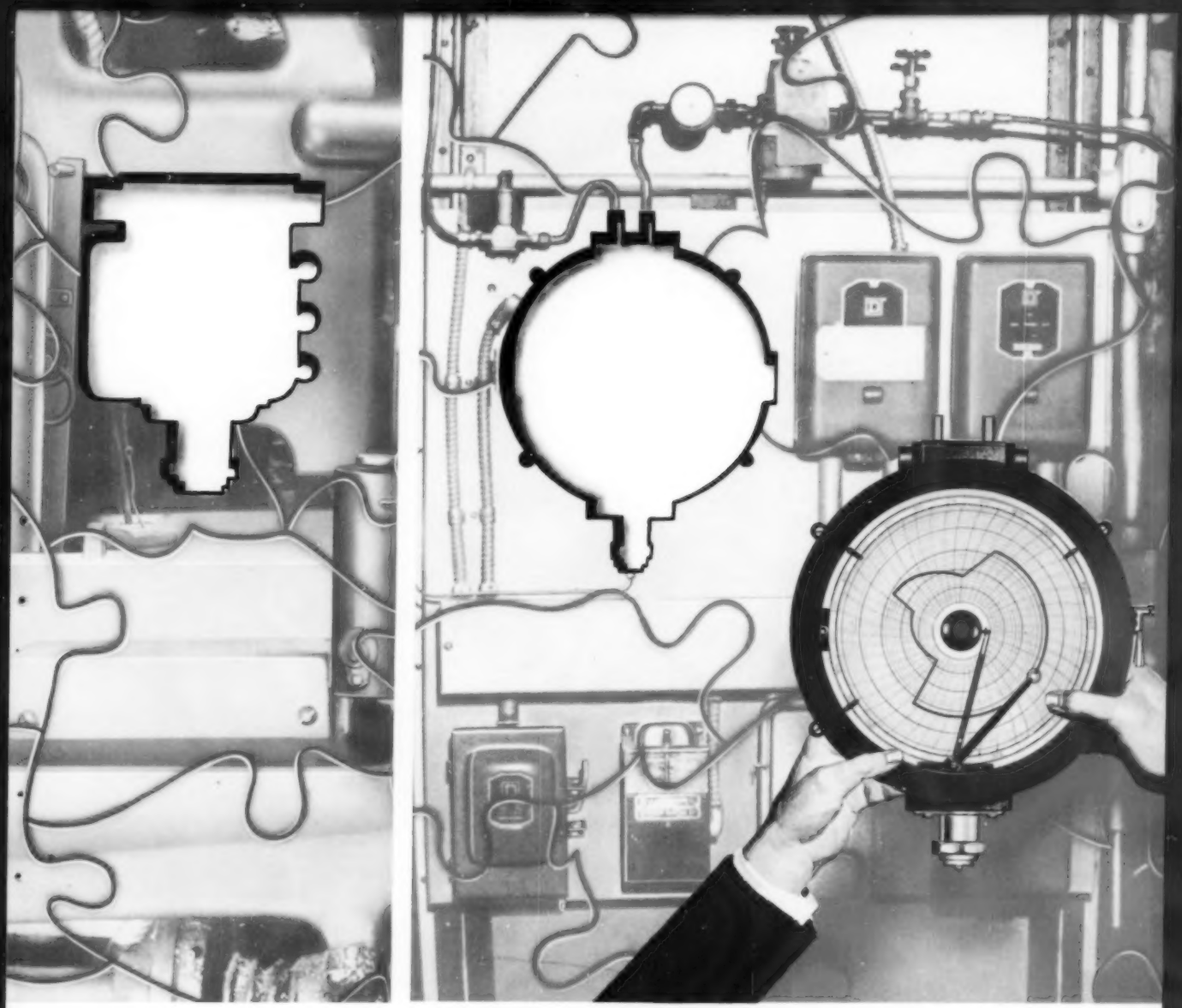
They can perform just as efficiently for *you*.

Partlow controls are actuated by the direct, positive power of mercury, require no mechanical or electronic amplification. Regardless of type, any Partlow you install will stand up to even extreme conditions of shock and vibration . . . without loss of accuracy or sensitivity.

And Partlow makes service headaches a thing of the past! All it takes to replace the Partlow thermal element is a wrench or screwdriver. No 'down time' necessary! The whole job can be done, right at the work site, in a matter of minutes.

If you need accurate, dependable temperature control anywhere within the −70° to 1100°F. range, you'll find a Partlow model to fit your requirements *exactly*.

Get full details without obligation. Fill out and mail the coupon now.



Versatile Partlow recording instruments keep rigid control of process temperatures, and prove it in writing.

Partlow makes the following types of controls and allied equipment for temperatures ranging from −70° F. to 1100° F.:

Electric
Mechanical
Pneumatic
Indicating
Non-Indicating
Recording
Explosion-Proof
Weather-Resistant
Limit
Program
Multi-Switch
Double Pen Recording
Process Timers
Safety Equipment
Thermometers
Control Accessories

41 Partlow Sales and Service Offices in Principal Cities of the United States, and the World.

World Export: Ad Auriema Inc., 85 Broad Street, New York 4, N.Y., U.S.A.

PARTLOW

TEMPERATURE CONTROLS

THE PARTLOW CORPORATION

New Hartford, N.Y., Dept. A

Please send condensed Catalog of Partlow temperature controls and allied equipment for industrial heating and refrigeration.

Name and Title.....

Company.....

Address.....

City and State.....

.....

The Arithmetic of Materials Handling

Fuller Airveyor unloads wood flour to two forty-five foot silos. Second Airveyor system reclaims material 360 feet to processing.

General Electric Changes From Bags to Airveyor ... Cuts Handling Costs 60%

As part of a program to increase plastics production and reduce operating costs at its Pittsfield, Mass. plant, General Electric Company called in Fuller engineers to design systems for handling wood flour in bulk.

Wood flour—used as a filler in phenolic molding compounds—was being handled in 75 and 100-pound bags. Unloading one carload of bags required 16 manhours. Bags were loaded on dollies and wheeled to a distant elevator.

SAFETY FIRST—The two pneumatic Airveyor® materials handling systems, engineered and manufactured by Fuller Company, were installed by its parent company, General American Transportation Corp., providing undivided responsibility. This installation resulted in a 60% saving in handling costs! The two systems are handled by one full-time and one part-time operator. Manhours to unload one car have been reduced from sixteen to six!

In addition, all equipment is designed to conform to strict safety specifications set down by G-E engineers.

FLOW *YOUR* MATERIALS—The Airveyor is a system that flows your material through sealed pipes. It's fast, safe, and self-contained. The pipes can be placed close to ceilings, run underground or through walls.

Whether you process wood flour—or other dry granular materials—look into the many economies of Airveyor conveying. Write today for interesting, detailed literature on Airveyor and other Fuller pneumatic materials handling systems.

FULLER COMPANY GENERAL AMERICAN TRADE MARK

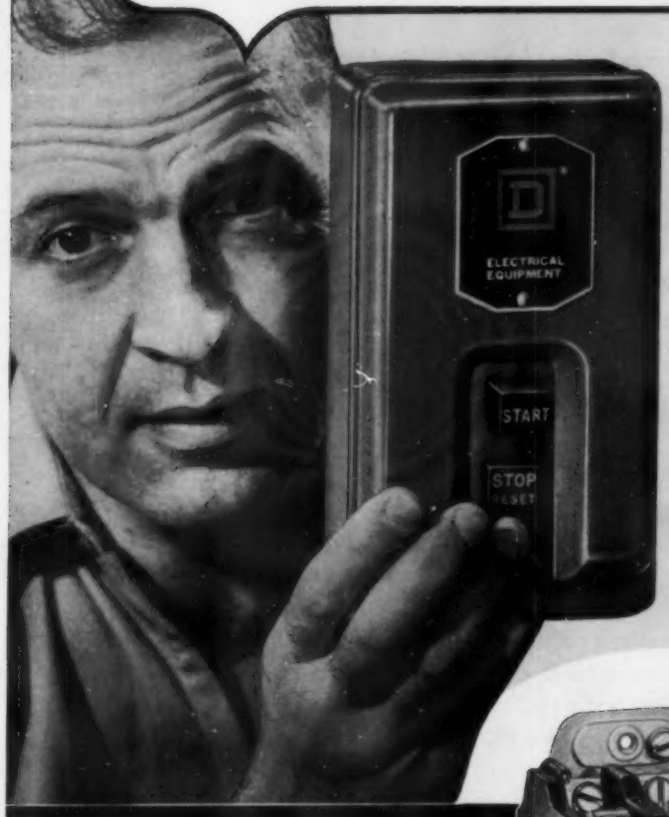
Fuller
....pioneers in harnessing AIR

FULLER COMPANY
138 Bridge St., Catasauqua, Pa.
Subsidiary of General American Transportation Corporation
Offices in Principal Cities Throughout the World

G-196
1304

For more facts circle 526 on Reply Card

This NEW Manual Starter has EVERYTHING!



NEMA Sizes 0 and 1

Two, three and four-pole construction

- ***SMALLER!*** Takes less space, whether it's built into machine or mounted externally
- ***SMART STYLING!*** Matches the streamlined appearance of today's modern machines
- ***QWIK-MAKE, QWIK-BREAK!*** Positive snap-action opening and closing of contacts. Longer contact life
- ***TRIP-FREE OVERLOAD PROTECTION!*** Impossible for operator to hold motor circuit closed against overload
- ***POSITIVE PROTECTION!*** Starter will not operate *without* overload units installed
- ***LONGER LIFE!*** *Toggle Action* operating mechanism. Heavy-duty construction throughout
- ***EASIER INSTALLATION!*** Wire it without removing starter from enclosure. All terminals have pressure wire connectors
- ***EASIER MAINTENANCE!*** "Off-the-Shelf" parts kits make normal maintenance and modifications easier than ever. They're easy to buy, easy to identify, and faster to install
- ***TAMPER-PROOF!*** Cover padlocking device prevents tampering by unauthorized personnel. Safety latch locks "start" button in "OFF" position
- ***VISIBLE INDICATION OF OVERLOAD!*** Self-centering push-buttons show when overload has occurred

CHOICE OF ENCLOSURES:

Water and Dust-Tight
Hazardous Locations
Flush Mounting

Write **for BULLETIN 2510 B-C**
Address Square D Company, 4041 North Richards Street, Milwaukee 12, Wisconsin

SQUARE D COMPANY

wherever electricity is distributed and controlled

For more facts circle 527 on Reply Card

"Here at MINNESOTA MINING we're coating*

3M COMPANY has branched out from its original sandpaper business into a wide variety of product lines. However, most of these product lines are direct descendants of sandpaper, 3M's original product, in the sense that **coating techniques* play an important part in these products. This is true of such seemingly unrelated items as presensitized lithographic plates, pressure sensitive tapes, decorative ribbon, roofing granules and reflective sheeting.

As specialists, we liked the OTIS specialist's approach to Elevator Maintenance right from the start. We decided it was the only way to keep our 6 OTIS Passenger Elevators and 10 OTIS Freight Elevators running at their original efficiency during their entire lifetime. We've been using OTIS Elevator Maintenance since 1933.

What is the OTIS specialist's approach to elevator maintenance? It is MEN . . . MATERIALS . . . METHODS.

MEN: Elevator maintenance is no one-man job. It is an organization task requiring experts in many lines. No individual, even if he devoted his entire time to the job, could do it properly. It calls for men with an unusual combination of skills plus long training in studying parts, assemblies, functions, replacement procedures, testing and adjusting. Some degree of elevator complexity can be gleaned from the illustration at the right.

MATERIALS: Original OTIS parts and specially designed OTIS maintenance equipment are within one hour of 90% of all OTIS elevators in the U. S. for use in scheduled replacements—and to hold emergency shutdowns to a minimum.

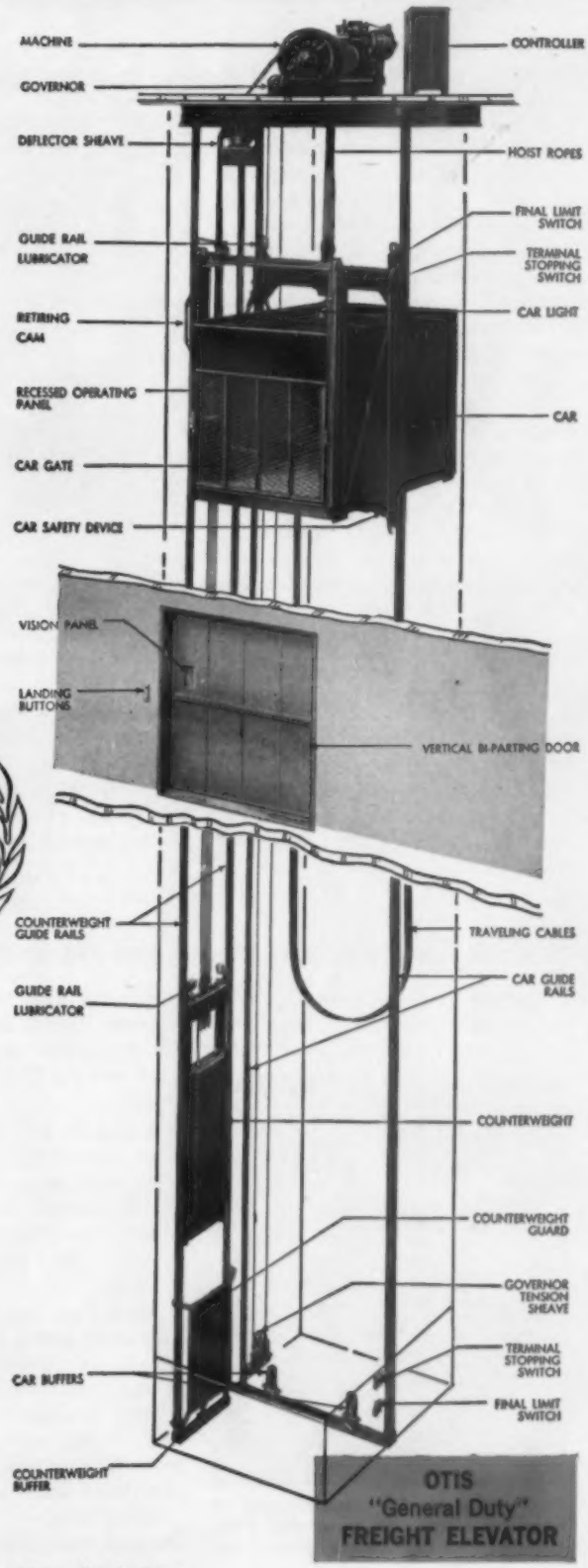
METHODS: With more than 40,000 elevators under OTIS maintenance, OTIS has developed an actuarial procedure that replaces wearing parts well in advance of their breakdown point to hold shutdowns to an absolute minimum and assure the highest possible safety.

freight elevator maintenance

THAT KEEPS ELEVATORS RUNNING LIKE NEW

OTIS ELEVATOR COMPANY • 260 ELEVENTH AVENUE • NEW YORK 1, N.Y.
OFFICES IN 297 CITIES ACROSS THE UNITED STATES AND CANADA

men . . . not elevator maintenance men"



3M COMPANY

MINNESOTA MINING
and
MANUFACTURING
COMPANY
ST. PAUL

For more facts circle 528 on Reply Card

PLANT ENGINEERS' DIGEST —so those who rush may read and know what's new

Edited by Marjorie E. Weissman

Fluoroscope and TV Inspection of Welds in Steel Pipe Detects Hidden Flaws Quickly

A CONTINUOUS fluoroscoping process which reveals hidden flaws in the welded seams of steel pipe has been developed by and is in use at our National Tube Division.

Pipe welds on large diameter electric welded pipe formerly were checked by X-ray, but only the end portions of each pipe section were inspected and procedure was slow.

The fluoroscope unit consists of an X-ray head which casts a shadow image of a weld on the fluorescent screen of an image intensifier. The image is intensified electronically and picked up by a television camera. The televised picture, greatly enlarged, then is viewed by an inspector on a television monitor screen.

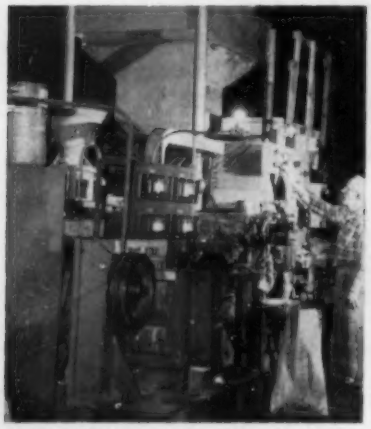
In operation, 40-foot sections of welded pipe are placed on a carriage which passes in front of the inspection booth. The X-ray head, mounted on a 48-foot boom, fits inside the pipe in line with the welded seam. The image is projected on the fluorescent screen as the pipe is conveyed past the booth.

X-ray head of fluoroscoping unit in pipe. Weld image is transmitted to TV screen.

Inside the booth, an inspector stands at a control panel which permits him to position the pipe and control its lateral movement. He can slow or stop the carriage instantly for prolonged examination of any portion of the weld. If a flaw is detected, he marks the spot by pressing a button which releases a spray of water-soluble white paint on the pipe. *From a release of United States Steel Corp., Pittsburgh, Pa.*

Volumetric Feeder Helps Make Constant-Color PVC for Wire Insulation

NATURAL COLOR (off-white) polyvinyl chloride is now extruded in desired colors and tints at the Ambridge, Pa. wire and cable plant of National Electric Div., H. K. Porter Co., by means of color chips metered into the PVC by a volumetric feeder.



Color chips are fed volumetrically by vibratory screw feed to natural PVC, ensuring even distribution of color tint.

A serious problem of achieving color control had existed when the color chips were added by hand to 250-lb drums of natural PVC, which was tumbled and then shoveled into the hopper of the extruder.

More than one-third more chips were being added than was required. Result was uneven color density, or tint, and possible varying uniformity in dielectric strength of the PVC being used as insulation on wire. Requirement is for one per cent color chips.

Installation of six volumetric dry material feeders adjacent to the vibrating conveyor trough which moves measured amounts of PVC into the extruder, has proved to be the solution. Metering by volume, the feeders supply a predetermined amount of dry material to a batch of PVC either continuously or by programmed cycles. National Electric is now saving more than $5000 a year in color chip and labor cost.

Through accurate and uniform distribution of the chips, the feeders assure uniformity of dielectric strength. They have also made possible establishment of firm, reproducible color standards.

Precision Construction Units

GROOVED SLABS of standard sizes, secured and locked tightly together by plastic discs, are being used in

(Continued on page 46)

NOW a single Condulet® for any make motor starter and circuit breaker!

★TYPE DMC: Dust-Ignition-Proof (Dust-Tight) — National Electrical Code Class II, Groups E, F and G; NEMA Type 9EFG.

★★TYPE WMC: Watertight — NEMA Types 3, 3R, 4 and 5.

UNIQUE COVER HINGING ARRANGEMENT allows DMC-WMC Condulets to be mounted directly adjacent to other Condulets without providing extra space between for cover to hinge open. Cover pulls out, then to either side to clear adjacently-mounted Condulets or other equipment.

CROUSE-HINDS TYPES DMC* AND WMC** Combination Line Starter CONDULETS

DMC-WMC Condulets are designed to accept and operate any of the various makes of motor starters and circuit breakers. Single speed non-reversing combinations are equipped with a universal mounting plate, motor starter reset assembly and circuit breaker operating assembly. No substitutions of any parts on the Condulets are required.

Built-in push-button stations and selector switches with various contact arrangements, pilot lights and control transformers can be supplied. Push-button and selector-switch operating shaft holes and pilot-light holes may be drilled, tapped and plugged for future use.

Separate mounting lugs are bolted on body. A center position is provided on back of body so that lugs can be attached for 3 point suspension or center pole (2 point) mounting. Circuit breaker handle has provision for padlocking in "On" or "Off" position.

WRITE for descriptive literature and specifications . . . or contact your Crouse-Hinds distributor.

CROUSE HINDS

MAIN OFFICE AND FACTORY: SYRACUSE, NEW YORK
Crouse-Hinds Company of Canada, Ltd., Toronto, Ont.

● CONDULET® ELECTRICAL EQUIPMENT (Explosion-Proof and Conventional) ● FLOODLIGHTING
● TRAFFIC CONTROL SYSTEMS ● AIRPORT LIGHTING and WEATHER MEASURING EQUIPMENT

These products are sold exclusively through electrical distributors. For application engineering help, contact one of the following offices: Atlanta Baton Rouge Birmingham Boston Buffalo Charlotte Chicago Cincinnati Cleveland Corpus Christi Dallas Denver Detroit Houston Indianapolis Kansas City Los Angeles Milwaukee New Orleans New York Omaha Philadelphia Pittsburgh Portland, Ore. St. Louis St. Paul Salt Lake City San Francisco Seattle Tulsa Washington
Resident Representatives: Albany Baltimore Reading, Pa. Richmond, Va.

For more facts circle 529 on Reply Card

PLANT ENGINEERS' DIGEST

(Digest begins on page 44)

Precision-cast grooved slabs are secured and locked by small plastic discs.

Sweden for construction of both exterior and interior walls.

The square-section slabs are cast to ±0.2mm tolerances and have longitudinal grooves into which one-inch diameter discs can be hammered.

Once the first layer of slabs is laid, the discs are inserted into the grooves at the junction points of the slabs. One half of the disc is left projecting. The next course of slabs is laid over the first, staggered so that the projecting halves of the discs in the lower course lock into the bottom grooving of the upper slabs.

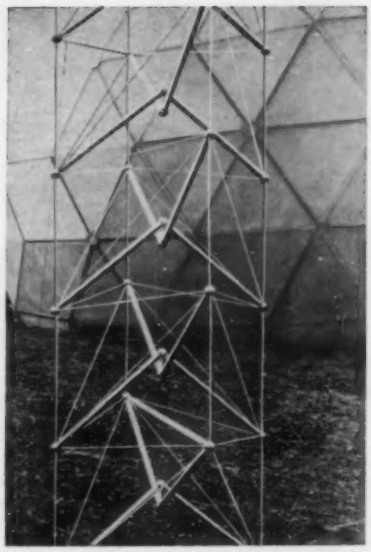
Corner joining of the slabs is simple: an extra groove is made at right angles to the longitudinal groove and in line with the groove of the abutting slab.

Partition walls, provided by rectangular-section slabs of lesser thickness are spiked into the external walls by means of small metal plates.

Strength and joint-tightness of walls provided by the precision-cast slab and groove locking is higher than that provided by conventional mortar bonding methods. Perfect mating of surfaces assures excellent sealing and improved insulation, according to the manufacturer, Ytong-bol-agent Gjorwellsg, Stockholm, Sweden. *From European Technical Digests, published by European Productivity Agency, Paris, France.*

Steel Aircraft Fasteners Add Strength to Unusual Structure

TWENTY AIRCRAFT BOLTS and mating nuts, rated at 220,000 psi tensile strength, have been used to erect, adjust and maintain rigidity in the new Tensegrity (Tension-Integrity) tower designed by Buckminster Fuller.



Part of 36-ft high tower designed to utilize high strength of steel fasteners.

It is believed to be the first application in building that capitalizes on the extra strength-to-weight ratio afforded by aircraft fasteners. The new structure shows that buildings —customarily designed around the compressive strength of steel structural members, can utilize steel's improved tensile properties. The result is structures with remarkably improved strength-to-weight ratios.

The experimental tower stands 36 ft tall, weighs 85 lb, and consists of 20 separate, tetrahedron assemblies. Each of these units is composed of two V-shaped aluminum tubes of one-inch diameter. The tubes are joined by their apexes by the aircraft bolts and separate thin wires of Monel metal of 5/32-in. diameter which complete the structure.

As the tension bolts are tightened, drawing the apexes together, the arms are pushed out to tense the Monel wires and erect the mast.

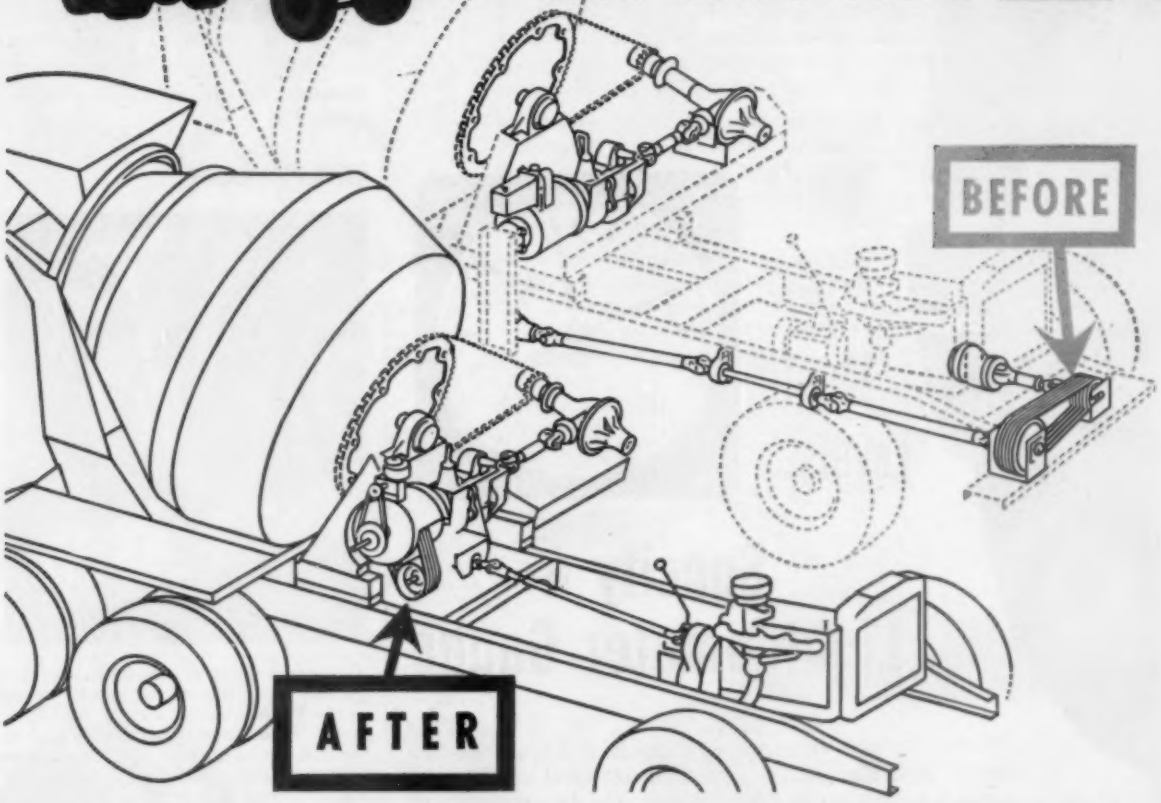
As the principal element in transferring load from one set of tension and compression members to the next, the bolt joining the two aluminum members is critical. Tensile loading on the bolt, according to the builders, is as great as the total loading exerted on the eight Monel wires around the perimeter. This is estimated at 1200 to 1500 lb for each of four diagonal Monel carry-

(Continued on page 48)

Combination Box, Stand and Hopper Simplifies Handling of Small Parts

Packaged muffler parts are handled at Goerlich's Inc., Toledo, Ohio, by system consisting of open box and stand with built-in hopper. As lift truck lowers box into position on stand, door in box opens and material flows into hopper. Door closes automatically. (From a release of Powell Pressed Steel Co., Hubbard, O.)

Simpler power take-off cuts drive costs 22%



Super HC V-Belts—packing higher hp capacity in smaller space than conventional V-belts—have eliminated need for front-end power take-off on concrete-mixer trucks made by Concrete Transport Mixer Company of St. Louis, Mo.

By letting take-off be shifted to rear, Super HC V-Belts cut drive costs alone by 22%, besides saving weight and cost of complex linkage and other components of the former front-end drive.

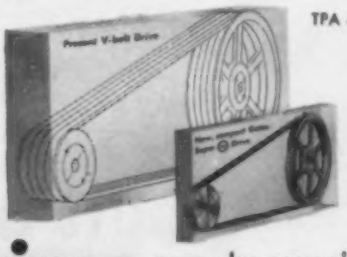
With Super HC, sheave diameters can be cut 30% to 50%, drive space up to 50%, and drive weight 20% and more. A product of Specialized Research in the world's largest V-belt laboratories, Super HC V-Belts are helping many manufacturers put more compact, lighter weight, lower cost drives on all types of machines.

Engineering Service Nation-Wide

What's *your* power transmission design problem? Your Gates Field Representative is ready to help you solve it—to cut space, weight, cost with Super HC V-Belt Drives. Ask him for your free copy of *"The Modern Way to Design Multiple V-Belt Drives"* or write The Gates Rubber Company Sales Division, Inc., Denver, Colorado.

The Gates Rubber Company, Denver, Colorado
Gates Rubber of Canada Ltd., Brantford, Ontario

Gates — *World's Largest Maker of V-Belts*

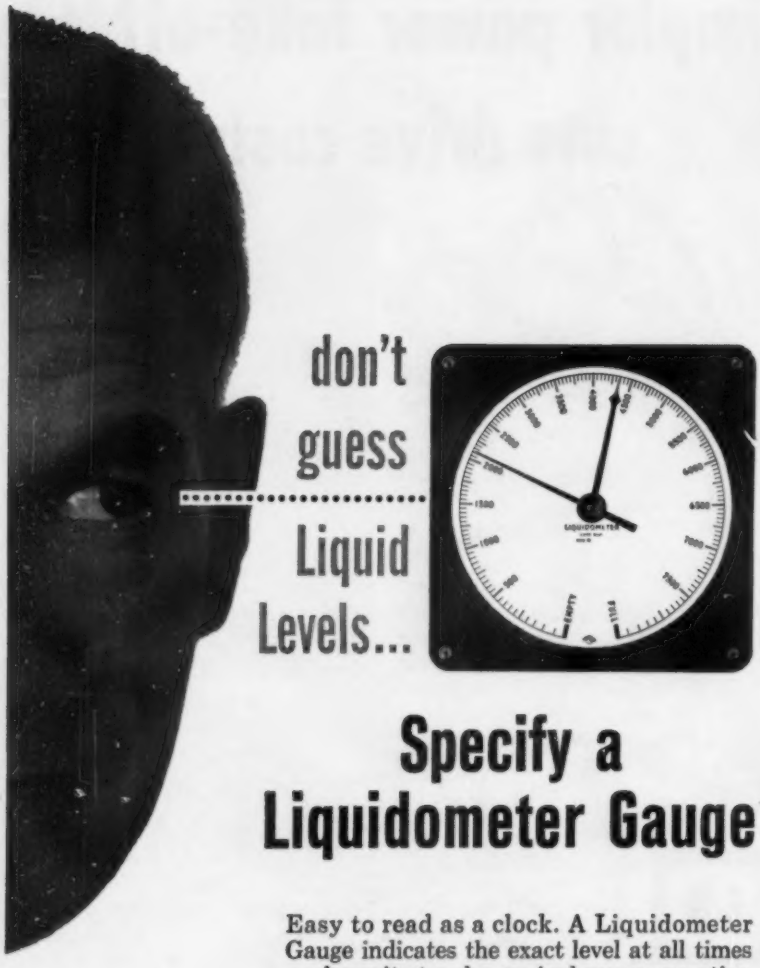


TPA 485

Gates Super HC V-Belt Drives

same hp capacity in smaller "package"

For more facts circle 530 on Reply Card



don't guess Liquid Levels...

Specify a Liquidometer Gauge

Easy to read as a clock. A Liquidometer Gauge indicates the exact level at all times ...shows it at a glance. And gauge operation is completely automatic—as far as 250 feet from the tank—without need for auxiliary power of any kind.

A Liquidometer Tank Gauge measures virtually any liquid. It's simple to install—requires no maintenance. Many have provided over 30 years of efficient, dependable service. All are approved by Underwriters' Laboratories and Factory Mutual.

Whether your gauging needs require an automatic Liquidometer Gauge, a hydrostatic Levelometer or a tank-site-indicating Direct Reader, you'll get the best by specifying Liquidometer. For complete details write Dept. B.

Since 1920 ...of proven quality

THE LIQUIDOMETER CORP.
LONG ISLAND CITY 1, NEW YORK

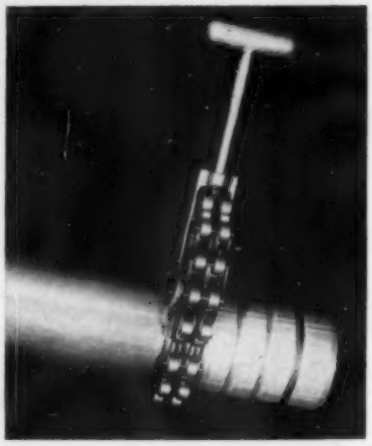
For more facts circle 531 on Reply Card

PLANT ENGINEERS' DIGEST

(Digest begins on page 44)

ing wires; somewhat less on the four verticals. By this reckoning, it is estimated that each ¼-in. diameter bolt is subject to total loading of 6500 lb. *From a release of Standard Pressed Steel Co., Jenkintown, Pa.*

Quick Pipe Repair



Damaged section of aluminum pipe can be cut out, replaced by repair sleeve made by Aluminum Supply Co., Spokane, Wash. Special grooving tool is rotated around pipe until complete seal is made, then pipe is ready for reuse. (From Kaiser Aluminum News, published by Kaiser Aluminum and Chemical Corporation, Oakland, Calif.)

Retractable Reel Stores Maintenance Hose

ROUTINE MAINTENANCE chore of washing down floors and equipment becomes a vital production job in food processing operations where sanitary conditions must be strictly controlled. At Peter Eckrich & Sons, meat packers in Ft. Wayne, Indiana, maintenance hose handling and storage were given prime consideration in planning expanded processing facilities.

Expansion plans called for more than 400 ft of ½-in. ID hose to be used at seven different stations. Since fork lift trucks would be used in the area, it was essential to keep hose off the floor when not in use. Coiling hose on hooks had been unsatisfactory, so spring retractable reels were installed. Each

For more facts circle 532 on Reply Card →

Allis-Chalmers uses **RYKON** *Grease in bearing shield —offers farmers better disc harrow*

Situation: Bearings of a disc harrow in service are always turning in dusty conditions, oftentimes completely covered with soil. Such bearings in the Allis-Chalmers harrow are protected with grease-coated rubber shields. The grease guards against dirt getting past the shield and into the bearing.

What was done: Allis-Chalmers project engineer in the LaCrosse, Wisconsin plant, Maynard Walberg, called Fred Parkinson, Standard Oil lubrication specialist, for a sample of RYKON Grease. In conditions simulating field service, RYKON Grease was tested. Bearings were rotated in the most abrasive dirt available—Mississippi sand with a high quartz fraction.

What happened: Tests were started and run to destruction. Prior to the use of RYKON Grease, bearing failures occurred at 500 hours. On switching to RYKON Grease, these tests were pushed to 2,000 hours. At this point, tests were stopped. Bearings were still in operating condition.

What you can do: Find out how RYKON Grease might help you offer your customers a better product. Inquire of the Standard Oil lubrication specialist nearest you anywhere in the 15 Midwest or Rocky Mountain states. Or write **Standard Oil Company (Indiana), 910 South Michigan Avenue, Chicago 80, Illinois.**

Can RYKON Grease help you improve your product?

You expect more from STANDARD *and you get it!*

Maynard Walberg, Allis-Chalmers project engineer, and Standard Oil lubrication specialist Fred Parkinson, examine disc harrow bearing assembly. Fred is well equipped through training and experience to help industrial customers with lubrication problems. He has been doing this work for 11 years at Standard. He has a degree in chemistry and engineering from Brown University. Plus that, he has completed the Standard Oil Sales Engineering School.

Quick facts about RYKON Grease

- Heat stable. At sustained high temperatures RYKON Grease remains soft and grease-like.
- Resistant to water-washing.
- Mechanically stable. Minimum change in consistency in service.
- Resistant to oxidation. Thickener acts as an inhibitor.
- Exceptional rust-preventive properties.

DAY

Pneumatic Conveying & Bulk Storage News

FREE! 2 valuable guides for selecting PNEUMATIC CONVEYING and BULK STORAGE TANKS

BULLETIN M-588—12 page DAY pneumatic conveying guide just off the press. Discusses types of systems, illustrates and diagrams high and low density arrangements, shows equipment and tells "why" and "wherefore" of all types of pneumatic conveying including so-called fluidizing systems.

BULLETIN 574—12 pages, describes horizontal and vertical storage tanks. Points out savings and is filled with photos of various installations plus description of auxiliary equioment.

Whatever your pneumatic conveying or bulk storage problem, look first in these DAY bulletins. They are valuable aids in selecting and ordering the right equipment for your plant. For your free copies use reader service card of this magazine or write direct toDAY.

The **DAY** *Company*

SOLD in UNITED STATES by
The DAY SALES Company
807 Third Avenue N.E.
Minneapolis 13, Minnesota

MADE and SOLD in CANADA by
The DAY Company of Canada Limited
Rexdale (Toronto), Ontario, Canada
Ft. William, Ontario, Canada

Representatives in Principal Cities

EQUIPMENT ONLY OR A COMPLETE SYSTEM

For more facts circle 533 on Reply Card

PLANT ENGINEERS' DIGEST

(Digest begins on page 44)

Spring reels keep hoses in packing plant out of aisles, free from damage.

reel is mounted overhead and handles 60 ft of ½-in. hose delivering water at 75 psi pressure with a temperature range of 55 to 155 F. Del Proctor, Plant Engineer, reports that hose handling time has been reduced 100 per cent by automatic rewinding, and with hose stored overhead, both sanitary and safety conditions are improved. Hose wear and damage is greatly reduced and no maintenance has been required on the reels. Reels permit the use of larger production rooms and make more usable space. *From a release of Clifford B. Hannay & Son, Westerlo, N.Y.*

Cuts Pipe Wastage

A COUPLING ADAPTOR, used in conjunction with a bending machine cuts pipe wastage at C. A. Parsons

Use of adaptor allows whole length of pipe to be fed into bending machine.

A Reliable Way to Judge a COPPER TUBE Piping System

. . . Look for this Mark JENKINS® of Quality Control

Jenkins Bros

Surest kind of assurance that it is a QUALITY installation is given by the famous Jenkins "Diamond" on valves controlling the lines.

Where "anything will do", you're not likely to see Jenkins Solder (or Socket) End Valves. But you can expect to find them on jobs handled by engineers and contractors who know an economy installation is one you can forget.

Compare Jenkins Solder End Valves with any others. You'll see why they are trusted to give a lifetime of reliable service with a minimum of attention.

Note the thick, smooth bore solder-joint ends that withstand heating and contribute to a quick, leak-proof connection. Look inside at the many Jenkins superiorities in design and construction.

A complete line of top-quality Jenkins Solder End (and Socket End) Valves is available from your local Jenkins Distributor. Ask him to show you a sample of the type you require.

SEND FOR NEW FOLDER No. 2 1 2

JENKINS VALVES

LOOK FOR THE JENKINS DIAMOND

JENKINS SINCE 1864 Jenkins Bros

Jenkins Bros., 100 Park Avenue, New York 17
Send folder No. 212 describing all Solder End and Socket End Valves.

Name & Title.....

Company.....

Address.....

For more facts circle 534 on Reply Card

Speed maintenance via air... Gardner-Denver air and tools

Waste no time. Put Gardner-Denver air power and tools on your maintenance team. Fast-acting Gardner-Denver air tools help your crew make the most of maintenance hours. Impact wrenches • air hoists • paving breakers • trench diggers • sheeting drivers • backfill tampers • utility drills • grinders • ratchet wrenches • concrete vibrators • nut setters.

Compact Gardner-Denver rotary portable compressors provide a steady, dependable supply of low-cost air. Rugged drawbar makes Gardner-Denver rotaries easy to move. Jackleg provided for quick setting-up. Big toolbox for air hose and tool storage. Write for information.

Gardner-Denver RP85-G (85 cfm) rotary portable air compressor

Gardner-Denver RP125 (125 cfm) rotary portable air compressor

EQUIPMENT TODAY FOR THE CHALLENGE OF TOMORROW

GARDNER-DENVER

Gardner-Denver Company, Quincy, Illinois

In Canada: Gardner-Denver Company (Canada), Ltd., 14 Curity Avenue, Toronto 16, Ontario

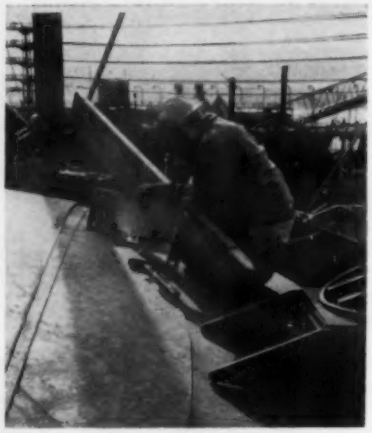
For more facts circle 535 on Reply Card

PLANT ENGINEERS' DIGEST

(Digest begins on page 44)

& Co., Ltd., Newcastle-on-Tyne, England. The adaptor is slipped over the last 4 ft 6 in. of pipe which formerly had to be scrapped. Into the opposite end of the adaptor is placed a 6-ft length of tubing which acts as a feeder. The pipe can then be fed into the bending machine without wastage. *From Target, published by Central Office of Information, London, England.*

Gas Holder Replaced on Short Order



Nine-man crew tore down and rebuilt 30,000 cu ft coke oven gas holder in 31 days. New water shell and lift shell were erected simultaneously, construction on water shell keeping one ring ahead of latter. (From a release of Bethlehem Steel Co., Bethlehem, Pa.)

Temporary "Weld" Holds Plastic Parts

SMALL INTERLOCKING or interfitting parts of molded nylon, which are difficult to hold in place during assembly because of their inherent and desirable slipperiness, can be made to adhere to each other temporarily with a drop of fluoroalcohol.

The fluoroalcohol is a very mild solvent which softens the adjoining surfaces of the slippery parts and, in effect, "welds" them together. The temporarily joined parts can be physically separated by the light mechanical stress encountered in normal operation of the assembled unit.

"Adhesion" usefulness of the fluoroalcohol was discovered when solving the problem of slippery

miniature nylon parts "popping out" of place during assembly of an auto heater part made entirely of molded nylon components. C3 fluoroalcohol was found to work effectively without damaging the plastic parts. *From a release of E. I. duPont de Nemours & Co., Wilmington, Del.*

Boiler Tube Inspection By Radiography

STANDARD X-RAY films and gamma radiation from Iridium 192 were recently used to inspect boiler tubes at our Stamford station. The work was done by the Magnaflux Corp. The isotope, in pills the size of a match head, was stored in a lead cylinder 7 in. in diameter and 18 in. long.

Because the isotope radiates in all directions when taken out of the lead shield, the work was done after regular working hours.

To inspect the tubes, a sheet of film was placed against one side of the tube to be radiographed while the isotope was placed on the opposite side about 44 in. from the film. The time exposure varied from five to 40 minutes depending on the density and thickness of the material being X-rayed and strength of isotope.

Results of the inspection showed that there was no appreciable oxide

Probe which will contain isotope is placed above tubes to be radiographed.

deposit in the tubes, although there was a moderate amount of pitting, possibly caused by the acid washing used to remove the oxide deposit after a tube failure 11 years previously. *From the Illuminator, published by the Hartford Electric Light Co., Wethersfield, Conn.*

PANELS MANUFACTURED BY FILON® PLASTICS CORP.

Acid-safe fire-safe translucent Hetron® panels enclose Kodak building

Those three points about fire-retardant Hetron panels made them a logical choice for Eastman Kodak Company's acid-still building when old siding had to be replaced.

Rigid, strong, meeting all building codes, these translucent fibrous-glass-reinforced panels never need painting. They reduce lighting loads, too.

How about *your* buildings? Do they need repair? Are you planning new ones?

Hetron-based panels have found a place in many industrial and commercial buildings. Shatterproof skylights on Brooklyn's huge Furman Street Pier. Geodesic dome structures on the DEW Line. False ceilings. Room dividers and many other uses. They come in a good many colors, too, for striking architectural effects.

If you would like more information on these fire-retardant panels, we suggest you write to Filon® Plastics Corporation, 333 North Van Ness Avenue, Hawthorne, California.

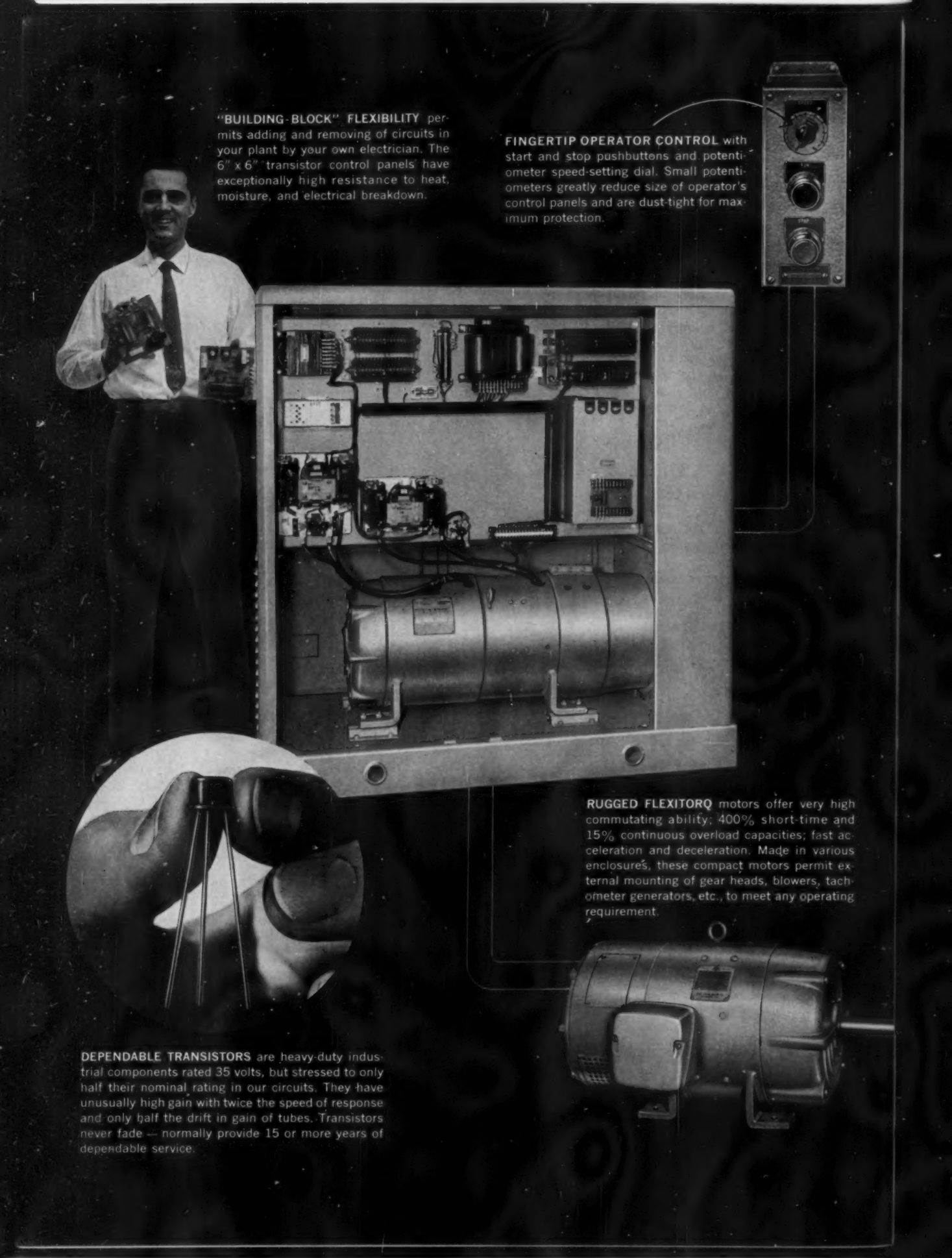
DUREZ PLASTICS DIVISION

3905 WALCK ROAD, NORTH TONAWANDA, N. Y.

HOOKER CHEMICAL CORPORATION

HOOKER CHEMICALS PLASTICS

For more facts circle 536 on Reply Card



"BUILDING-BLOCK" FLEXIBILITY permits adding and removing of circuits in your plant by your own electrician. The 6" x 6" transistor control panels have exceptionally high resistance to heat, moisture, and electrical breakdown.

FINGERTIP OPERATOR CONTROL with start and stop pushbuttons and potentiometer speed-setting dial. Small potentiometers greatly reduce size of operator's control panels and are dust-tight for maximum protection.

RUGGED FLEXITORQ motors offer very high commutating ability; 400% short-time and 15% continuous overload capacities; fast acceleration and deceleration. Made in various enclosures, these compact motors permit external mounting of gear heads, blowers, tachometer generators, etc., to meet any operating requirement.

DEPENDABLE TRANSISTORS are heavy-duty industrial components rated 35 volts, but stressed to only half their nominal rating in our circuits. They have unusually high gain with twice the speed of response and only half the drift in gain of tubes. Transistors never fade — normally provide 15 or more years of dependable service.

Another NEW product from Louis Allis

It's ideal for single-motor and synchronized multi-motor drives for:

- Extruders
- Wire-drawing machinery
- Machine tools
- Conveyors
- Calenders
- Paper machinery
- Textile machinery
- Printing presses
- Test stands
- Adjustable frequency power supplies

and many other applications

The New LOUIS ALLIS Select-A-Spede® Drive —First with field-proved All-Transistor Control

a high-gain, high-performance d-c drive with unmatched flexibility and low upkeep

Here's a superior adjustable speed drive with simplified transistor-magnetic amplifier control. It's the easiest drive to set up and operate. A twist of the dial gives you stepless speed adjustment from zero to full speed in either direction. Each adjustment is independent, thus sparing you the need for compensating adjustments of inter-related settings. You get more consistent day to day operation because transistors — *unlike tubes* — are highly dependable.

The new Select-A-Spede defies obsolescence. To add functions, such as current limit, to your basic drive, you simply have your electrician install the "current limit" transistor circuit panel. These "building-block" panels allow you to add any of the 13 control circuits that changing conditions call for — and they are immediately available from Louis Allis stock. Thus a rebuilding or adaptation job that, on former equipment, cost thousands of dollars — excluding down-time — can now be done at a fraction of the cost and time *right in your own plant!*

Transistor control practically eliminates upkeep and down-time. High quality transistors, field proven in missiles and other advanced electronic equipment, assure you of a high degree of dependability with a life expectancy of 15 or more years. Printed low-voltage transistor circuits are virtually trouble-free and can be quickly and easily replaced from low-cost stock.

Further savings are provided by the new Louis Allis Flexitorq® drive motors through vastly improved commutation, low brush wear, and their ability to safely withstand momentary overloads of 400% of normal horsepower rating.

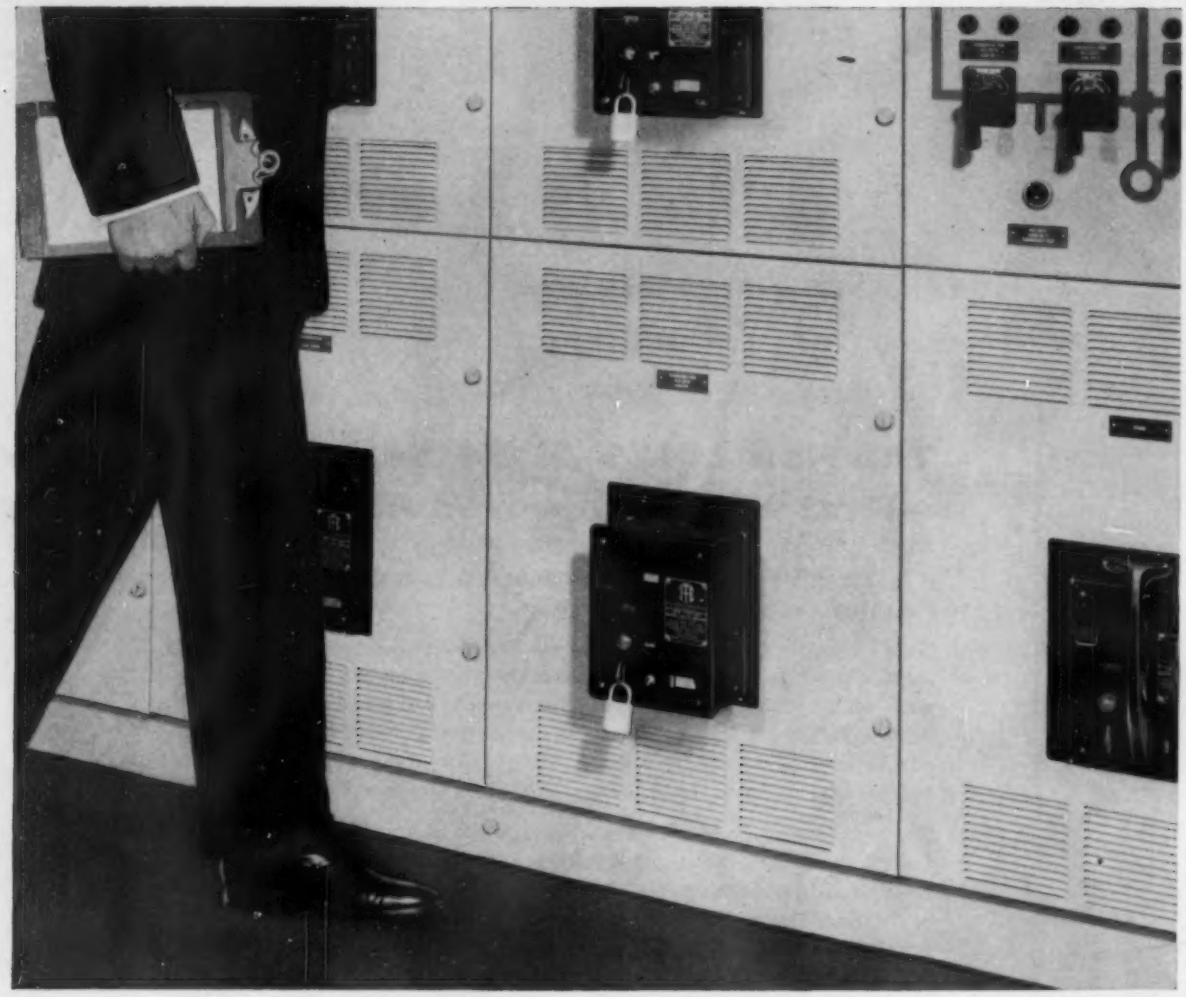
If you want superior speed regulation on your drive, check the new Louis Allis Select-A-Spede with *all-transistor* control. Sizes from 5 to 400 hp — in a wide range of enclosures and speed ranges up to 20:1. Contact any one of the 60 Louis Allis District Offices for information and application assistance. Or write for bulletin 2001 to The Louis Allis Co., 434 E. Stewart St., Milwaukee 1, Wisconsin.

MANUFACTURER OF ELECTRIC MOTORS AND ADJUSTABLE SPEED DRIVES

LOUIS ALLIS

For more facts circle 537 on Reply Card

SA-916



Several of these circuit breakers are in the disconnected position. Yet the doors are safely closed. Wouldn't you like this feature in the switchgear you are going to live with for 20 years?

Why stumble over a circuit breaker door for 20 years?

Don't let yourself be pushed around by a 600 volt switchboard. Fight back. Insist on equipment that lets you rack the breaker out to test or disconnect position without ever opening the door . . . completely safe equipment with no live parts exposed and no open doors to admit dust (see maker's name below).

Only one make of 600 volt switchgear offers this advantage (see name below). In 1957, when this line was introduced, it was the first to give you the miracle of manual stored energy closing. Today, naturally, you expect stored energy in any make of switchgear you buy.

But only this one company (see below) offers the additional advantages of completely closed door disconnect, plus expanded range trip devices that let your breakers grow with your loads. Each trip device has three to four times the range of conventional devices. Saves both cost and downtime.

The surprise is that you pay no more for this—today's most advanced 600 volt gear. Why settle for anything else? For complete descriptive Bulletin 6004-C, write I-T-E Circuit Breaker Company, Dept. SW, 1900 Hamilton St., Philadelphia 30, Pa.

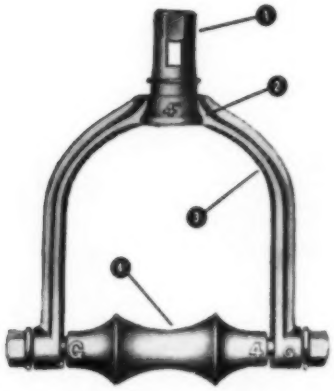
I-T-E CIRCUIT BREAKER COMPANY

For more facts circle 538 on Reply Card

Look at all the extras you get in Grinnell Pipe Hangers . . . yet you pay no more!

GRINNELL C-CLAMP, FIG. 88 — 1 Ribbed, malleable iron casting, for extra strength **2** Hardened steel, cup-point set screw for good "grip" on beam **3** Full thread engagement – casting is drilled and tapped for rod and set screw

GRINNELL EXTENSION SPLIT RING, FIG. 138 — 1 Nipple engaging thick section of malleable iron gives rigidity for support from above, below or from wall **2** Tapped to take screw. No nut to lose **3** Special ring contour holds pipe or tubing firmly



GRINNELL ADJUSTABLE SWIVEL PIPE ROLL, FIG. 174 — 1 Swivel shank permits adjustment without elaborate support **2** Locking device prevents accidental adjustment change; no lock nut required **3** Ribbed design in malleable iron for better strength, lightness, appearance **4** Easy installation; maximum adjustment

GRINNELL CB CONCRETE INSERT, FIG. 282 — 1 One body size accommodates several sizes of rods **2** Slot takes reinforcing rods to assure maximum load rating **3** One-piece body prevents concrete seepage **4** Teeth on insert and nut hold rod firmly in place **5** Homogeneous composition of malleable iron throughout

You get *more* hanger for the money from Grinnell, because Grinnell's huge volume reduces production costs . . . lowers prices right into line with competitive hangers offering less.

Yet you get *so much more* . . . wider choice of types and sizes; better quality control; published ratings for *all* hangers; faster delivery from warehouses nationwide; and more responsible field service by trained Grinnell personnel . . . regardless of how far from the job site the sale was made! Grinnell Company, 277 West Exchange St., Providence 1, R. I. Branch Warehouses in Principal Cities.

Remember, The Best Costs No More — from America's #1 Supplier of Pipe Hangers and Supports

Call your local Grinnell Distributor for pipe hangers, cast and malleable iron fittings, malleable unions, steel nipples – all made by **GRINNELL**

For more facts circle 539 on Reply Card

For more facts circle 540 on Reply Card →

Yale midget king

link chain hoists are the newest development in the full line of Yale lightweight electrics. The versatile Midget King lets the operator pick up material not directly under the hoist itself because the durable alloy type link chain flexes in any plane. Easy to move and store, the Midget King can be operated for less than two cents a day. Hook or trolley models are available, in capacities of ⅛, ¼, ½, 1 and 2 tons.

Hoist-and-load protecting upper and lower limit stops plus two brakes provide positive safety. Hardened alloy steel gears assure lengthy, economical service. Roller chain models of the Midget King are also available. The complete line of Yale hand, air and electric hoists is ready for you — to accomplish any overhead handling task.

Contact your Yale distributor listed under "Hoists" in the Yellow Pages of your phone directory. Or write for brochure #577H to The Yale & Towne Manufacturing Co., Yale Materials Handling Div., Phila. 15, Pa., Dept. MH2.

Yale Materials Handling Division, a Division of The Yale & Towne Manufacturing Company. Manufacturing Plants: Philadelphia, Pa., San Leandro, Calif., Forrest City, Ark. Products: Gasoline, Electric, Diesel and LP-Gas Industrial Lift Trucks Worksavers · Warehousers · Hand Trucks · Industrial Tractor Shovels Hand, Air and Electric Hoists.

YALE®

INDUSTRIAL LIFT TRUCKS
TRACTOR SHOVELS · HOISTS

YALE & TOWNE

YALE
MODEL
W
YALE

LOWEST COST LIGHTesT WEIGHT

INLAND SMALL PATTERN 4-WAY* SAFETY PLATE

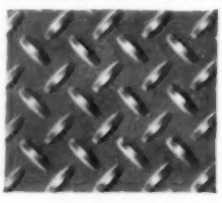
It's a fact—Small Pattern 4-WAY Safety Plate gives you all the protection of raised-lug pattern steel, yet saves many pounds of weight in the finished job and many dollars in initial costs—*Gives you more square feet of protection per dollar than any other rolled steel flooring.*

Thousands of uses in every plant and office—for kick plates, scratch plates, column covers—on walls, truck beds, work benches, machinery platforms, mobile equipment—also on stairways and catwalks where weight-saving is a major factor.

Small Pattern 4-WAY is easily fabricated into any desired shape—can be drilled, sawed and punched with ordinary hand tools. It's easy to maintain and lasts for years.

INLAND small pattern 4-Way safety plate is 18 gage and weighs only 2.4 lbs. per sq. ft. It comes in widths up to 42″ and lengths up to 152″, with a 5/8″ lug.

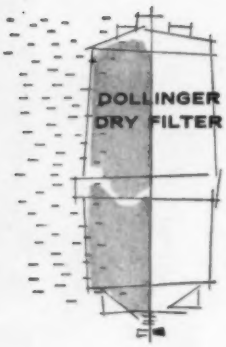
AVAILABLE FROM YOUR STEEL SERVICE CENTER



*Registered Trademark

INLAND STEEL COMPANY • 30 W. Monroe St. • Chicago 3, Ill.

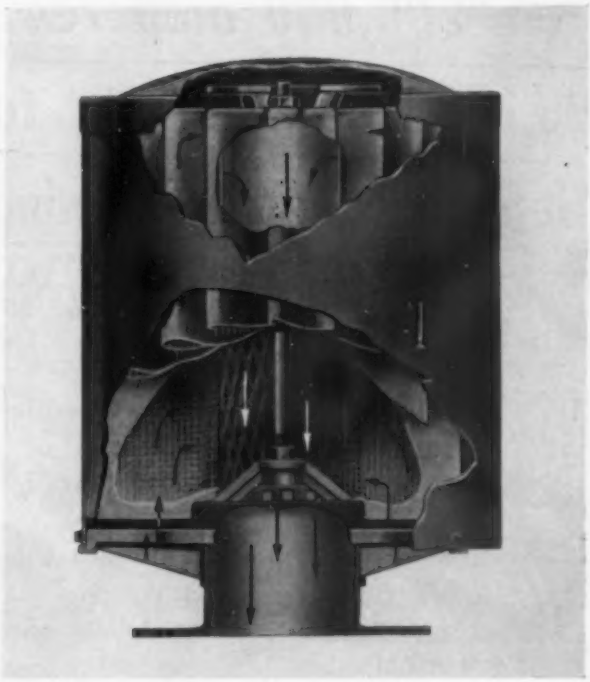
For more facts circle 541 on Reply Card



SPECIALISTS
FOR 39 YEARS

LOWEST INITIAL RESISTANCE OF ANY DRY-TYPE INTAKE FILTER

Filters for internal combustion engines, compressors and blowers



DOLLINGER STAYNEW FILTERS are designed for direct application to engines, compressors and blowers or to outdoor piping without the need for foundations, supporting frames, or weather louvers. Staynew's Radial Fin Construction utilizes the very best filtering medium available. Offers the greatest active filtering area in any given space . . . low pressure drop with maximum efficiency . . . extended periods of service without maintenance. Threaded pipe connections or flanges make for ease and solidity of installation. For cleaning and inspection, the weather housing does not need to be removed—a small cover is taken off, a bolt unscrewed, and the insert merely lifted out; this is a major advantage in the case of very large models. Available with capacities ranging from 60 to 10,000 C.F.M. Multiple units available for larger capacities. Write for Intake Filter Bulletin 100. Dollinger Corporation, 7 Centre Park, Rochester 3, New York.

PROTECTOMOTOR
STAYNEW
FILTERS

DOLLINGER

LIQUID FILTERS • PIPE LINE FILTERS • INTAKE FILTERS • HYDRAULIC FILTERS • ELECTROSTATIC FILTERS • MIST COLLECTORS • DRY PANEL FILTERS • SPECIAL DESIGN FILTERS • VISCOUS PANEL FILTERS • LOW PRESSURE FILTERS • HIGH PRESSURE FILTERS AUTOMATIC VENTILATION FILTERS • NATURAL GAS FILTERS • SILENCER FILTERS

For more facts circle 542 on Reply Card

NOW! Fuses that...

Safely interrupt fault currents up to 200,000 amperes...

Limit fault current to very low values

Hold 500% load for minimum of ten seconds

Buss Low Peak fuses can completely revolutionize the protection of the entire electrical system.

Protect Mains, Feeders, Branch Circuits, Motors, Controllers, Switches—no matter whether the fault current is 1,000 amperes, 25,000, 100,000—or as high as 200,000 amperes.

Reduce stresses and prevent damage to Panel-boards, Switches, Motor Controllers—other circuit components—because let-thru fault currents are limited to exceptionally low values.

Prevent work stoppages, lights out, waste of time and money—because long time-lag keeps them from opening needlessly on motor starting currents or other harmless overloads.

Permit increasing interrupting capacity and current limitation on present system at minimum cost.

Before designing a new installation—
or modernizing old installations—

GET ALL THE FACTS

Knowledge without action is of little value—but ACTION NOW may save you money—increase operating efficiency and reduce electrical hazards to a minimum.

BUSS LOW-PEAK fuses fit standard Switches and Panel-boards and are available in N.E.C. sizes from 15 to 600 amperes in both 250 and 600 volt ranges.

Write for BUSS LOW-PEAK Bulletin Now . . . or use coupon.

Bussmann Mfg. Division
McGraw-Edison Co.
St. Louis 7, Mo.

BUSS
Low-Peak
FUSES

Bussmann Mfg. Division, McGraw-Edison Co.
University at Jefferson, St. Louis 7, Mo.
Please send BUSS Low-Peak Fuse Bulletin LPS.

Name.....

Title.....

Company.....

Address..... City..... State.....

Pe-560

For more facts circle 543 on Reply Card

OPERATION AND PRODUCTION —pointers for the industrial plant engineer

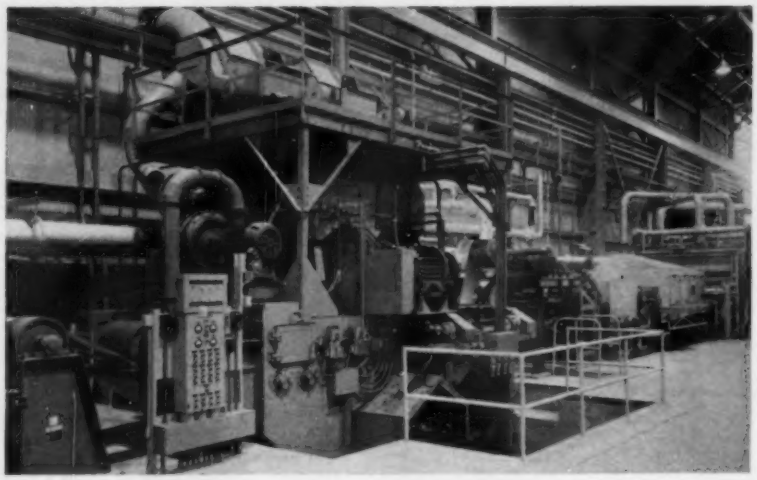
Edited by Vern Kempf

Special Blast Descaling Equipment Cleans Two Strips of Stainless Steel in One Pass

DESCALING stainless steel coils with a special abrasive blasting machine is helping Universal-Cyclops Steel Company keep processing costs under control in their new Coshocton, Ohio, plant. The shot blast equipment, manufactured by Pangborn Corporation, is designed to provide a degree of flexibility not previously available.

To fit Universal-Cyclops requirements, the blast descaling machine is designed to handle two strands of steel simultaneously. Individual strand control permits the coils to process through the descaling operation at different line speeds.

To provide additional flexibility, the position of the blast wheels can be changed at the touch of a push-button to produce the most effective targeting of both top and bottom blast streams for the particular widths of steel being processed at the time.



Two strands of stainless steel move through the mechanical descaling operation. No operator is needed after the machine is set for degree of blast required.

Steel shot in sizes S-70 and S-110 is the abrasive used. Effective abrasive cleaning and recycling equipment is built entegrally with the machine so abrasive can be used over and over again.

Precision Weighing of Steel Beams Reduces Waste—Permits Accurate Rolling

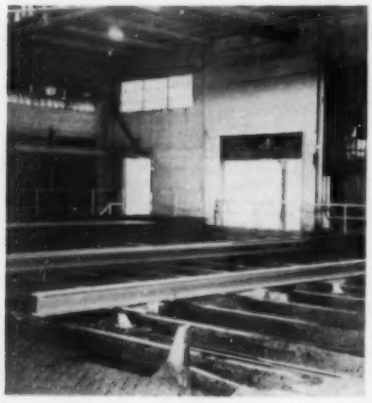
WHOLE I-BEAMS, as long as 40 ft and weighing as much as 2500 lb, are being weighed immediately after rolling at a large Pennsylvania steel mill. The weighing is done on an electronic device which uses SR-4 load cells as the sensing elements.

Prompt weighing permits accurate rolling to specifications and reduces waste. Before the electronic weighing system was installed, an entire beam could not be weighed. Instead, a sample draft, cut from a beam was weighed on a mechanical scale located in another building. Even if the draft showed the beam over or under weight, several more beams could be rolled incorrectly before an adjustment could be made.

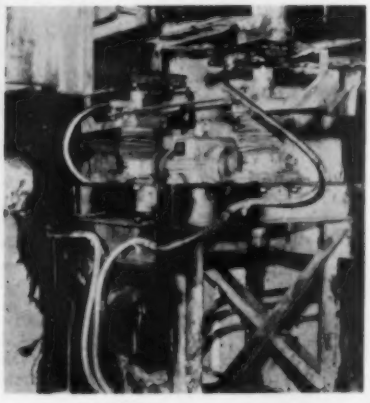
With the new electronic system, furnished by Baldwin-Lima-Hamilton Corporation, instructions can be flashed instantly to the roller should the beam be outside of the two per cent tolerance allowed. Subsequent rollings can be adjusted to fall within prescribed tolerances.

Beams are weighed at the front of the hotbed before they are moved to the rear for cooling. Between the hotbed rails, eight support rails project from a platform beneath the bed. This platform rests on four 2000-lb load cells, one at each corner. Between the base of each load cell and the concrete piers that support the system is an elevating superstructure which can raise

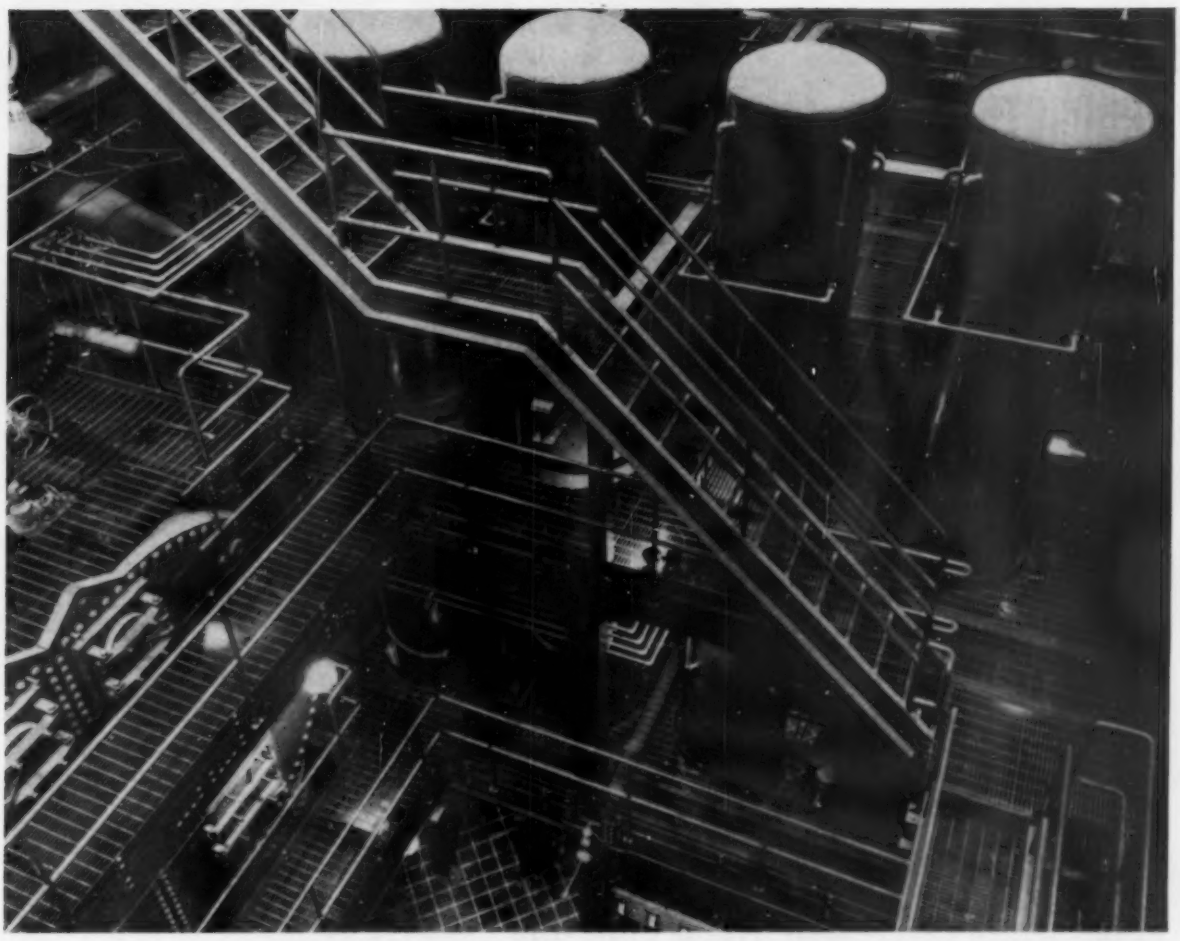
(Continued on page 66)



Chain slides beam along hotbed until it is positioned over weighing structure. When weighing structure is raised, beam is lifted clear of hotbed rails and weight is transmitted to load cells.



View of pit below hotbed rails shows two load cells and supporting structure below one end of the weighing platform. Gearbox raises and lowers load cells and platform when a beam is weighed.



METAL FLOORING

Which of these 10 Ryerson types is best for you?

For complete and unbiased help on your metal flooring requirements you can count on Ryerson because:

ALL TYPES AVAILABLE—Steel and aluminum, open and solid, pressure-type and welded, etc.—any quantity.

FURNISHED READY TO USE—Cut to job requirements or in standard sizes.

ENGINEERING ASSISTANCE AVAILABLE—Help in matching types and materials to service needs, layout and fabrication assistance, etc. is yours for the asking.

FAST SERVICE—Standard types in stock for immediate delivery, other types quickly available.

FLOORING AND STAIRWAY PRODUCTS IN STOCK

RY-WEDG OPEN FLOORING (carbon steel, stainless steel* or aluminum*)
RY-WELD® OPEN FLOORING (carbon or stainless* steel)
RYEX® EXPANDED METAL GRATING
MORTON KASS SAFETY TREAD
INLAND 4-WAY® SAFETY PLATE (carbon or stainless* steel)
REYNOLDS ALUMINUM DIAMOND TREAD PLATE
RELATED PRODUCTS: stringer channels, structural tubing, decorative panels of expanded metal, etc.
*Available on special order.

METALOGICS
RYERSON PLUS VALUES

STEEL • ALUMINUM • PLASTICS • METALWORKING MACHINERY

RYERSON STEEL®

Joseph T. Ryerson & Son, Inc., Member of the INLAND Steel Family

PLANT SERVICE CENTERS: BOSTON • BUFFALO • CHARLOTTE • CHICAGO • CINCINNATI • CLEVELAND • DALLAS • DETROIT • HOUSTON • INDIANAPOLIS
LOS ANGELES • MILWAUKEE • NEW YORK • PHILADELPHIA • PITTSBURGH • ST. LOUIS • SAN FRANCISCO • SEATTLE • SPOKANE • WALLINGFORD

For more facts circle 544 on Reply Card

OPERATION — PRODUCTION

(O and P begins on page 64)

the weighing supporting rails above the level of the hotbed by means of an electrical drive mechanism.

As the elevating structure raises a beam for weighing, a change of resistance within the load cell is transmitted as a change of voltage to balance motors located in the dial mechanism in the console. The signal moves the pointer on the calibrated dial until the exact weight of the beam is indicated. This weight is simultaneously printed on a logging card. After weighing, the elevating mechanism automatically lowers the beam to the hotbed.

Recirculating Air Saves Heat

By K. F. Biddle, Plant Engineer, Sundstrand Aviation, Rockford, Illinois

PROVIDING tempered makeup air in areas where sizable quantities of air are being exhausted is a problem in most industrial plants. Our test cells are one such area, as considerable heat is given off by the equipment and large volumes of air is exhausted from the rooms to keep them reasonably cool.

Makeup air, provided by fans is no problem in summer months, but in winter the steam coils required to temper this large volume of air are huge. The amount of air required in the winter is naturally less than required in the summer and we have tried approaches such as two speed fans with the tempering coil sized to the low speed and also two separate makeup fans one with and one without a steam coil.

The most satisfactory answer so far is a supply fan with fresh and return air dampers. A dual bulb element positions the dampers. One bulb is in the return air duct and senses room temperature. The other bulb was installed to stabilize damper action and is located in the fan discharge. This bulb senses changes sooner than the bulb in the return air duct and prevents cycling of the dampers.

An auxiliary contact on the damper motor starts the room exhaust fan when the outside air damper has opened to a predetermined point thus maintaining a positive pressure in the room. Using mixed air has reduced the danger of tempering coil freezeup and has reduced the size of the heating coil required.

Fan mounted on roof of test cell. Suction side is connected to outside and return air ducts, equipped with dampers.

Plastic Enclosure Aids Welding

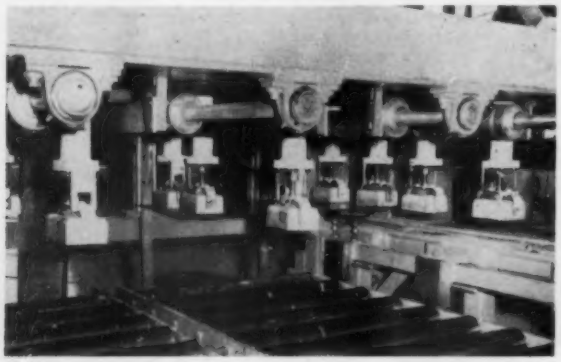
ENGINEERS at Solar Aircraft Company, San Diego, California, have developed a plastic enclosure which has proved practical as a

Magnetic Destacker Boosts Production by Feeding Stacked Sheets Automatically to Conveyor

AUTOMATION is used to a high degree in a line producing completed distribution transformer tanks at the Westinghouse Electric Corporation plant, Athens, Georgia. Heading this line is a magnetic destacker supplied by National Electric Welding Machines Company, Bay City, Michigan.

In operation, cold rolled steel sheets, cut to required sizes up to 69 in. by 48 in., are picked up individually from the top of a stack by lifting magnets. They are raised against driven permanent magnetic rolls which, in turn, feed them to a conveyor. The conveyor, similarly equipped with magnetic rolls, feeds the sheets to a numbering machine, roll former and other equipment.

Use of the magnetic units in the destacker represents a significant design improvement by replacing other types of lifting devices previously employed. Produced by Eriez Manufacturing Company, the lifting magnets and magnetic rolls assure dependable performance in this key unit which sets the pace for the entire production line.



Lifting magnets pick up top sheet from stack resting on roller conveyor and raises sheet to magnetic rolls at top.

Driven magnetic rolls from destacker at left passes the sheets to magnetic rolls on roller conveyor to feed line.

means of protecting titanium metal from the atmosphere while it is being welded. Because of its light weight and heat resistance, titanium has become a vital material in the manufacture of high-speed aircraft.

However, in the molten state, titanium has an affinity for the elements in the atmosphere. It reacts

Plastic dome, fitted to metal base, is filled with argon gas to shield titanium welding. Armports are fitted with gloves to permit welding at any angle.

with nitrogen, oxygen and hydrogen forming metallic compounds which cause the welded joints to be brittle and porous.

Designed at Solar Aircraft, the protective chamber permits welding to be done in the presence of argon, an element which does not affect the metal. The device consists of a hemispherical enclosure, made of transparent Plexiglas, a product of the Rohm and Haas Company. The plastic dome is mounted on a metal base to which it can be sealed to exclude the outside air.

Gloved armports are fitted to the dome to permit the weldor to work at any angle required. After the titanium parts are placed in the chamber, the inside air is replaced with argon gas and the welding can then proceed without difficulty.

Drill Multiple Holes Fast

BY SUSPENDING a 17-in. Delta drill press from an angle iron wall bracket, S & S Visual Company, Brooklyn, N. Y., can now drill panels of almost any width. A multiple-spindle attachment, with extension spindles on either side, permits drilling up to 15 holes in a 35-in. line simultaneously.

Unlimited throat capacity is ob-

THE POWERS REGULATOR COMPANY
Dept. 560,
Skokie 23, Illinois

Send me a free copy of Powers Engineer's Manual For Steam-Water Service

Name:_____

Title:_____

Company:_____

Address:_____

City:_____ Zone:____ State:_____

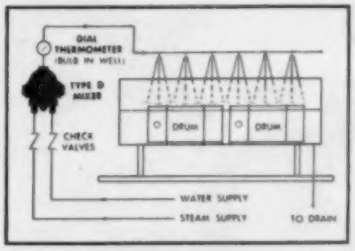
Specific requirement or problem:

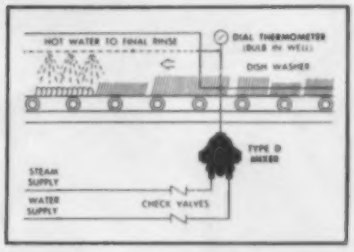
_____

_____

_____

How To Maintain Uniform Process Hot Water Temperature





Schematics above show the function of Powers Type D Mixer in standard systems for maintaining uniform process hot water temperature where it is not practical to install or use a steam heated storage tank. These drawings are taken from the Powers *Engineer's Manual, Steam-Water Service* which is free to you for the asking. Each drawing is supplemented with detailed engineering information about the controls used. Everyone concerned with the installation and/or operation of steam-water service will find these diagrams a helpful guide in laying out a new system or updating an existing one. Other sections offer similar easy-to-follow diagrams and concise details on the following:

- Domestic Hot Water
- Hot Water Storage Heaters
- Instantaneous Heat Exchangers
- Heat Exchangers For Cooling
- Fuel Oil Heaters
- Pressure Reducing
- Jacket Water Cooling
- Two-Temperature Hot Water Systems

Fill in the above coupon to get your copy of this informative steam-water service manual.

POWERS CONTROL

THE POWERS REGULATOR COMPANY
Dept. 560, Skokie 23, Illinois
In Canada: The Powers Regulator Co. of Canada Ltd. Downsview P. O., Toronto, Ont.

For more facts circle 545 on Reply Card

Grinding operation, dust control piping overhead.

No two dust control problems are alike!

Grinding operation, dust control "down draft" under floor.

Since no two dust control problems are alike, a Kirk and Blum engineering survey determines the exact nature of *your* specific application. It's all part of K & B's *complete* service to assure you the best system for your particular need, all factors considered.

From survey time until the system is completed and in operation, Kirk & Blum handles the entire job with one undivided responsibility . . . a condition only possible when you have *one* source for all service, *one* guarantee for all components.

Write today for the new 52-page K & B Catalog or a no-obligation survey of your particular problem. The Kirk & Blum Mfg. Co., 3189 Forrer St., Cincinnati, 9, Ohio.

KIRK & BLUM *Complete Dust Control Systems*

For more facts circle 546 on Reply Card

OPERATION—PRODUCTION

(O and P begins on page 64)

Upside down drill press provides unlimited throat capacity and multiple spindle permits drilling 15 holes at once.

tained by suspending the drill press from its base which is attached upside down to the wall bracket. The adjustable spindles permit positioning the holes without turning the drill press on its column.

The drill press is used for drilling assembly screw holes in display rack components. Panels up to 30 in. wide and 60 in. long are customarily drilled on the table. Up to 200 panels are drilled each day with this setup, several times faster and more accurately than with the portable electric drill used previously.

Air Handling System Gives Multistory Building New Life

EXECUTIVES at Lincoln Plastics, Stamford, Connecticut, credit a pneumatic conveying system with making possible the successful use of a reconditioned multistory building. The cost of the space and building which would be required if this were to be done as a one-story operation would have made the whole process uneconomical.

Lincoln Plastics manufactures plastic wall tile and produces a variety of products in both crystal and high impact type polystyrene. Plagued by the problem of stocking huge quantities of raw materials involving a six-figure inventory, the

Even at 1000 to 1 odds...

YOU WOULDN'T MAKE A RED CENT

...on a bet like this!

If you bought 1,000 G-E Fluorescent Lamps and gave us $1 for every one that lit . . . and we gave you $1,000 for every one that didn't . . . chances are *the best you could do is break even!*

Those are pretty good odds—1,000 to 1. But if this bet is ever offered to you don't take it. You wouldn't make a red cent!

BECAUSE G-E MONEY SAVER LAMPS ARE MORE UNIFORM—Test after test of production lamps proves that, on the average, *999 out of every 1,000 G-E Fluorescents will be good, right from the start.* (You might even *lose* money on the bet because many actual users report their performance to be even better than this!)

G-E FLUORESCENT LAMPS DO SAVE YOU MONEY—Whether you buy a carton or a carload, the uniformity you get from General Electric Fluorescents—lamp after lamp after lamp—is your best assurance of getting the most light for your money. Not only do you get 999 sure starters out of every 1,000 G-E Fluorescent Lamps you buy, but after almost two years 990 of them will still be going strong! So you not only get more light, but your maintenance and production people like the freedom from annoyance and interruptions.

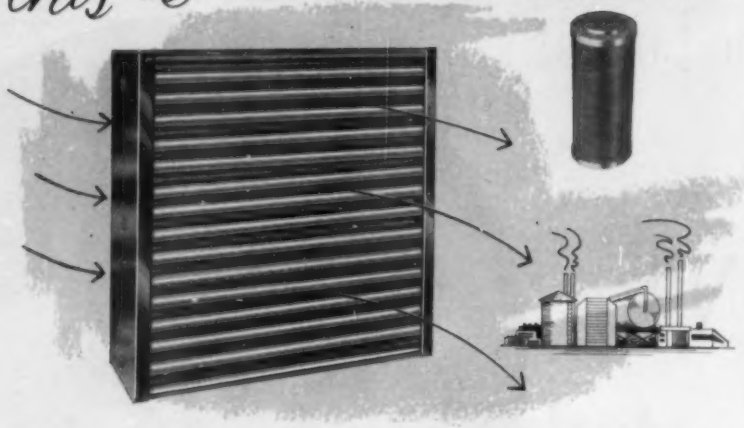
Performance like this stems from General Electric's constant search for new ways to improve *all* G-E Fluorescent Lamp types. Make sense? Then place your next order for lamps with your G-E Lamp distributor now—or write: General Electric Co., Large Lamp Dept. C-013, Nela Park, Cleveland 12, Ohio.

Progress Is Our Most Important Product

GENERAL ELECTRIC

GENERAL ELECTRIC . . . WHERE BRIGHT IDEAS BECOME BETTER LAMPS

this is DOREX



27 years of Research, Development, and Application make it the most effective, economical method of AIR RECOVERY and ODOR CONTROL

WHAT DOREX IS . . .

Dorex equipment is designed in two basic types—C Cells and H Canisters—Dorex acts exactly like a gas mask, using activated carbon to adsorb air-entrained odorous, gaseous, and vaporous irritants and impurities. As a direct result of the carbon's highly effective purging action, stale and/or contaminated air is purified and reconverted to its original healthful freshness, ready for sanitary re-use in air conditioning systems. The Dorex process eliminates the biggest obstruction to maximum economy in air conditioning.

HOW DOREX WORKS . . .

Dorex efficiently solves the several air pollution problems menacing business, industry, and the general public: purification of severely contaminated intake air (smog); purification of recirculated air; purification of contaminated exhaust air.

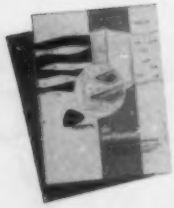
WHERE DOREX IS USED . . .

Dorex is used throughout business and industry, in combination with air conditioning and ventilating systems . . . in office buildings, department stores, food processing plants, distilleries, electrical and electronics plants, atomic energy labs, paper factories . . . virtually anywhere that polluted air creates severe problems of offensive odor, equipment corrosion, and toxic atmospheric conditions.

WHY DOREX IS THE MOST EFFECTIVE

Dorex engineers always select the type of carbon that years of Connor research and experience have proved is most successful in different given situations. There is *no single all-purpose* type of activated carbon that can be applied successfully in all air recovery and air purification situations.

CONNOR... for Constant Comfort Conditions



Request—on your letterhead, please—copies of Dorex Bulletin 108A and the authoritative air purification textbook available only from Connor, "Air Conservation Engineering".

CONNOR ENGINEERING CORPORATION

DANBURY • CONNECTICUT

CONNOR ENGINEERING CORPORATION dorex® air recovery

For more facts circle 548 on Reply Card

OPERATION—PRODUCTION

(O and P begins on page 64)

company decided to install a basic polymerization unit so they could produce their own raw materials. At the same time it was decided to install a Sprout-Waldron pneumatic conveying system to cut handling costs.

After the polystyrene is prepared, it is taken by the air handling system to three 50,000 lb capacity outside storage tanks. The diced polystyrene is moved from any of the storage tanks to a holding tank on the roof of the building at rates up to 4000 lb per hour. The system involves a horizontal run of 40 ft and a vertical lift of 70 ft. All movement of the raw material is controlled at a central pushbutton switching station.

Signs Improve Employee Relations

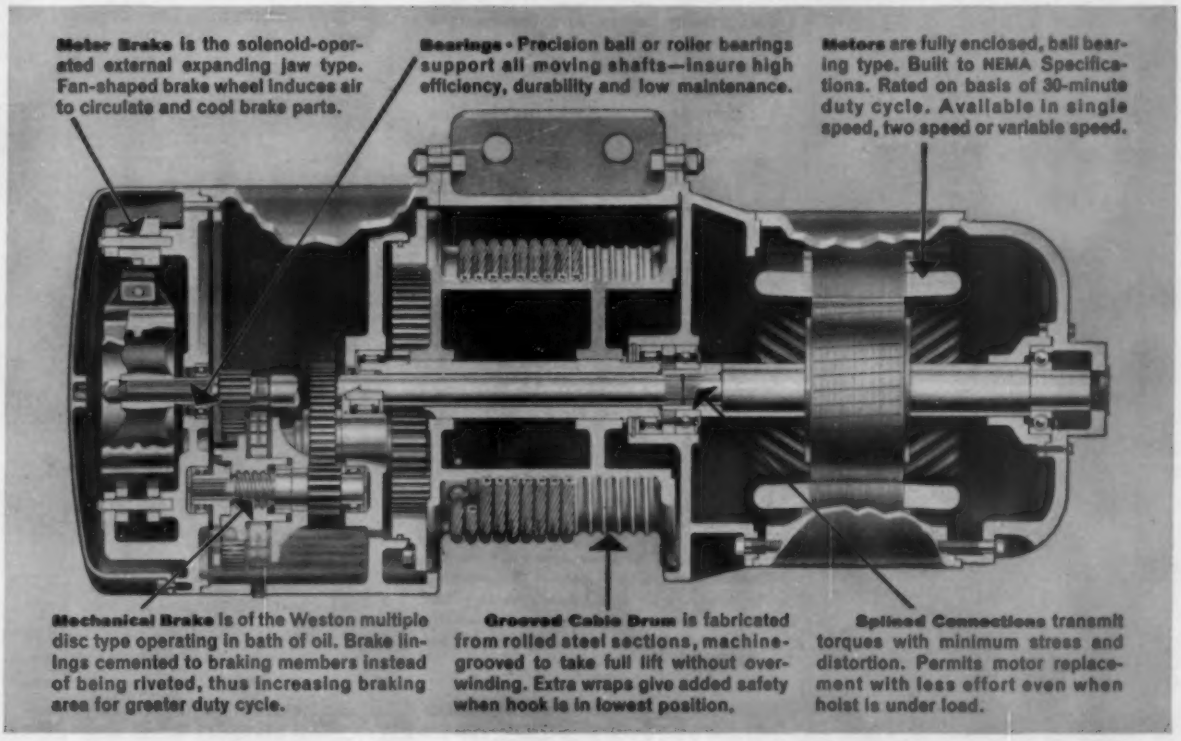
For the past several years, The Timken Roller Bearing Company, Canton, Ohio, has been placarding machine tools and equipment with purchase price, year bought and machine number. The company has found this a valuable assist in employee relations as it serves as a constant reminder to all employees as to what it costs in goods to create jobs.

Fast Core Drying Cuts Costs

INSTALLATION of a core oven equipped with dielectric heaters has enabled Dick Brothers, Inc., Reading, Pa., to improve the quality of

You Can't Buy a Low-Priced Hoist with the Outstanding Performance and Maintenance Features You Get as Standard Equipment from Wright

Feature for feature, you are years ahead with a WRIGHT *Speedway* Electric Hoist. Designed and manufactured to meet the varied demands of modern high speed production, *Speedway* Hoists give you the safety, adaptability, ruggedness and efficiency which you can't get in a low-priced hoist. Many of these performance and maintenance features are exclusive with WRIGHT. So if you are considering the purchase of an electric hoist, it will pay you to investigate the advantages of WRIGHT *Speedway* Hoists. For complete information, write our York, Pa., headquarters for **Catalog E-58.**


Motor Brake is the solenoid-operated external expanding jaw type. Fan-shaped brake wheel induces air to circulate and cool brake parts.
Bearings • Precision ball or roller bearings support all moving shafts—insure high efficiency, durability and low maintenance.
Motors are fully enclosed, ball bearing type. Built to NEMA Specifications. Rated on basis of 30-minute duty cycle. Available in single speed, two speed or variable speed.
Mechanical Brake is of the Weston multiple disc type operating in bath of oil. Brake linings cemented to braking members instead of being riveted, thus increasing braking area for greater duty cycle.
Grooved Cable Drum is fabricated from rolled steel sections, machine-grooved to take full lift without overwinding. Extra wraps give added safety when hook is in lowest position.
Splined Connections transmit torques with minimum stress and distortion. Permits motor replacement with less effort even when hoist is under load.

WRIGHT HOISTS

Wright Hoist Division • American Chain & Cable Company, Inc.

York, Pa., Atlanta, Chicago, Denver, Detroit, Houston, Los Angeles, New York, Philadelphia, Pittsburgh, San Francisco, Bridgeport, Conn.

For more facts circle 549 on Reply Card

THE BRIDGE TO *Progress* AND *Safety...*

The bridge in this picture, designed to carry both horse power and man power across the Root River, represents a step to further expansion of Western Printing and Lithographing Company facilities in Racine, Wis.

Western selected Globe's Safety GRIP-STRUT grating on this bridge for greater safety and for greater economy. Safety GRIP-STRUT is the new basic material, all in one piece (including channels), not welded, riveted or expanded, in steel or aluminum, in standard sizes and gauges. It presents an open space, in a diamond pattern, in excess of 55% of the area for a positive NON-SKID footing in all directions. It is also ideal for work platforms, stair and ladder steps, flooring, balconies, catwalks, machinery guards, fire escapes and for original equipment safety treads.

IMPORTANT SAFETY FEATURES:

Fire proof, slip proof, maximum strength, minimum weight, easy to stand and walk on, cool in summer, warm in winter.

BIG ECONOMY FEATURES:

For balconies—no extra light needed below—no extra heat. No extra supports needed—Channels are integral part of the material. No secondary sprinkler heads necessary. Self cleaning. Cut and installed like lumber by your own maintenance force. Low in original cost.

Write for new complete catalog. Distributors in all principal cities. Consult yellow pages in phone book under "GRATING".

GRIP-STRUT PATENTED

PRODUCTS DIVISION

THE GLOBE COMPANY

4016 S. PRINCETON AVENUE

CHICAGO 9, ILLINOIS 117

For more facts circle 550 on Reply Card

OPERATION—PRODUCTION

(O and P begins on page 64)

its products while making major space and manpower savings.

Used to bake small sand cores, the oven has two Allis-Chalmers 25-kw dielectric heaters as its source of heat energy. In these units, 60-cycle electric power is changed to direct current by a rectifier section and then converted to high frequency power by an oscillator section. The high frequency power is then carried directly to the baking oven.

This system of core making reduces baking time from hours to a few minutes and eliminates cooling time. By doing away with the cooling step, the cores go directly from the oven to the molder, saving additional handling.

Mixes using synthetic resin binders, usually recommended with dielectric sand core baking, save up to half the mulling time required for conventional mixes. The smoother finish of resin bonded cores results

Feed end of foundry core baking oven equipped with 25-kw dielectric heaters.

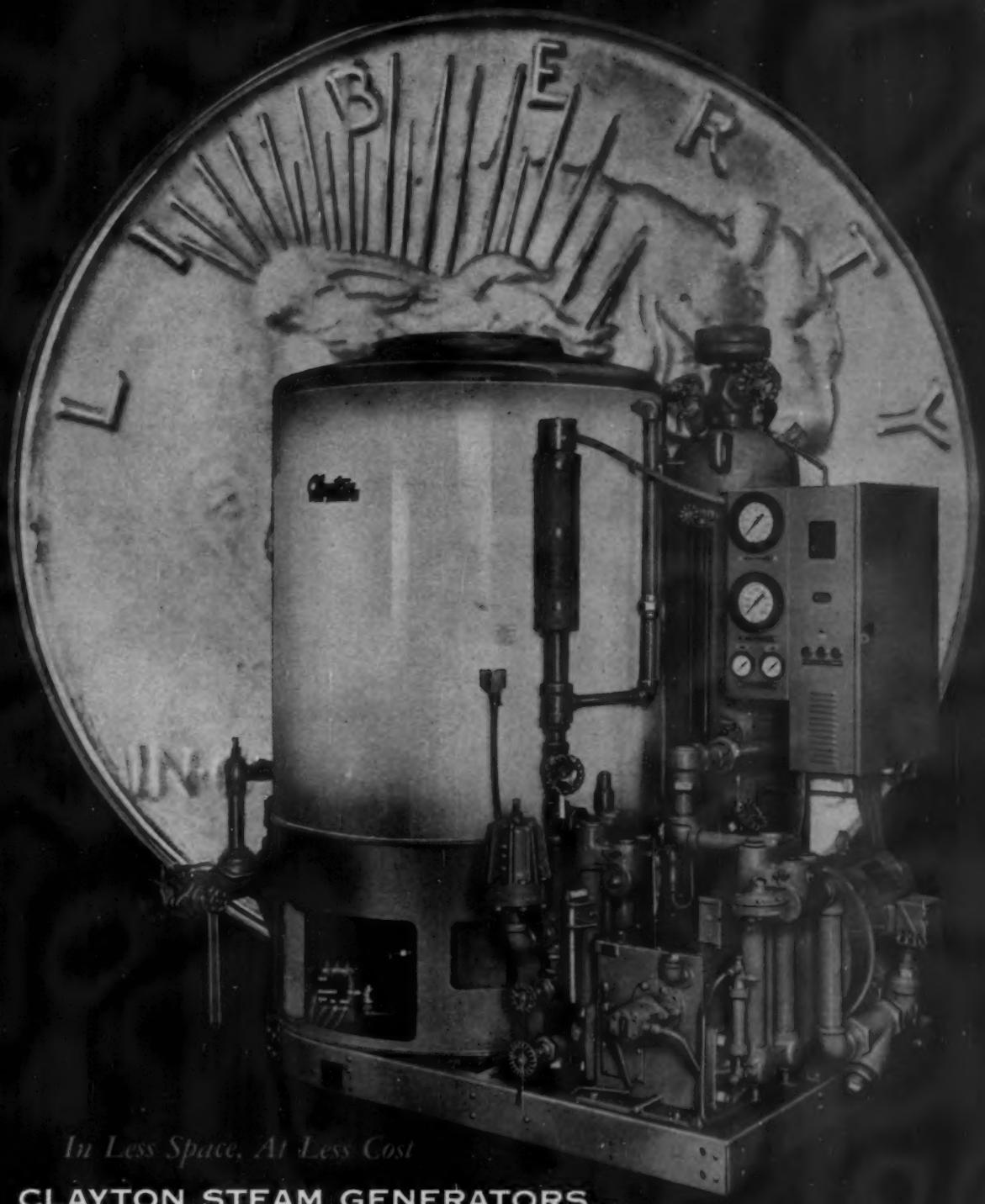
in a smooth finish on the castings and cleaning time is reduced.

Storage space normally required for cooling and building up stock when the foundry used a gas oven has been reduced by 100 sq ft.

Since the oven is ready to use in 30 seconds without requiring preheating, fuel costs have been substantially reduced. To insure uniform baking for various sized cores, a variable speed conveyor belt control regulates the belt speed according to the baking time of the core.

For more facts circle 551 on Reply Card →

STEAM THE MODERN WAY



In Less Space, At Less Cost

CLAYTON STEAM GENERATORS...

SAVE SPACE AND INSTALLATION COSTS—Only a fraction the size and weight of ordinary boilers. Models from 16½ to 175 HP. All sizes 65 to 195 psi. Larger sizes 15-295 psi.

SAVE ON STEAM—You pay only for the steam you use. Steam in 3 minutes or less from cold start—no standby loss.

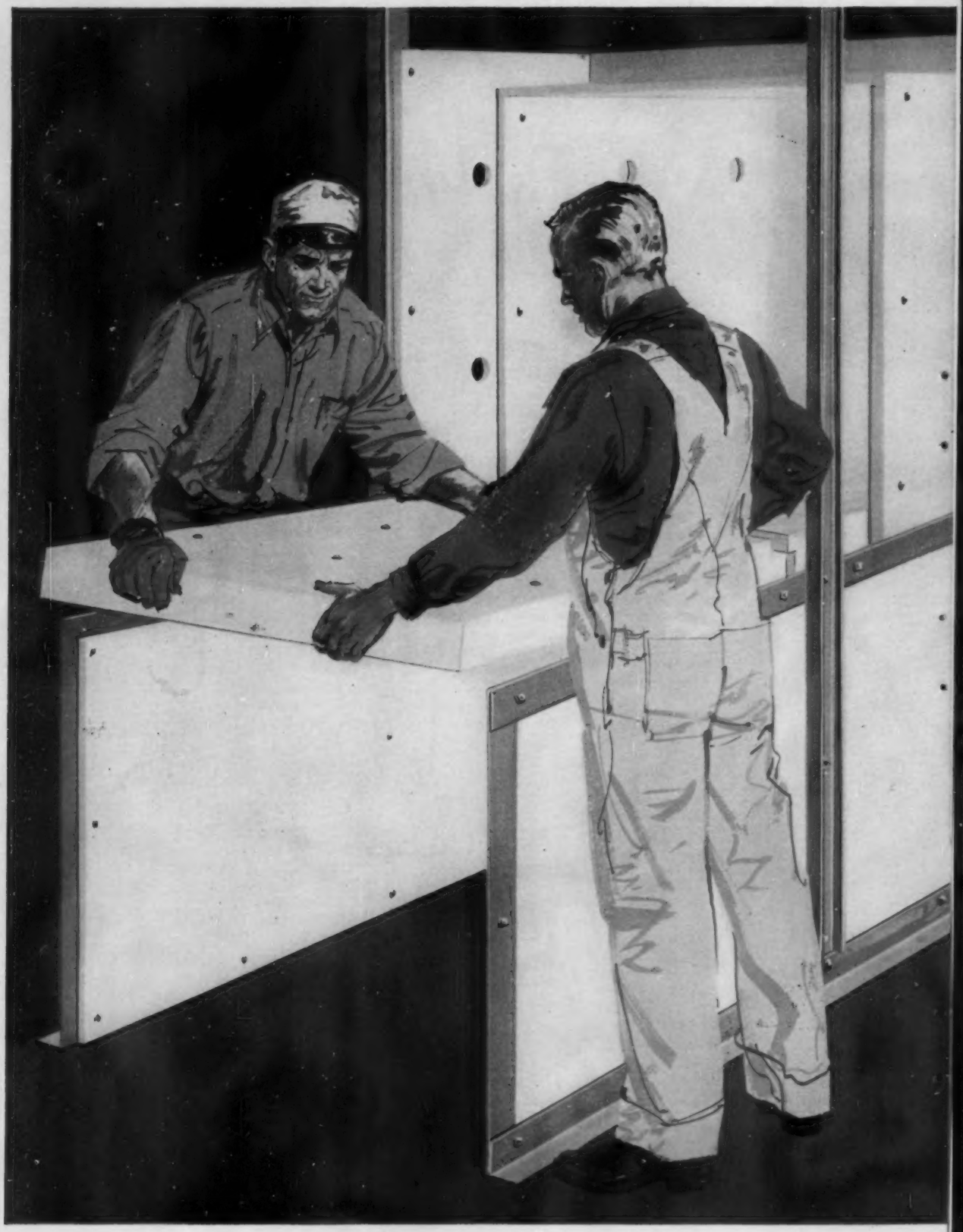
SAVE ON OPERATING COSTS—Cut fuel costs up to 50%, save labor, maintenance and time.

Write today for more complete information.

Clayton

416 MANUFACTURING COMPANY

EL MONTE, CALIFORNIA • CINCINNATI, OHIO



WORKABLE MARINITE *comes in rigid, fireproof standard 4' x 8' and up to 4' x 10' sheets . . . in a variety of densities and surfaces.*

Oven and dryer building made easier!

J-M MARINITE® *is both oven wall and insulation in one workable material!*

To build the most efficient ovens and dryers you've ever operated, all you need is one material: Marinite. J-M Marinite is a rigid insulating material that also serves as your oven and dryer wall. You build and insulate (up to 900F) in *one* operation with *one* material. Marinite is an unequaled combination of efficient insulation and structural strength. It costs you no more in place than other materials, and saves you time and effort.

HERE'S WHY:

MARINITE IS WORKABLE. It cuts easily. Your own shop can prefabricate panels from large 4′ x 8′ or 4′ x 10′ sheets with standard saws and drills . . . and assemble them quickly. Rigid Marinite requires a minimum of structural support.

MARINITE CUTS MAINTENANCE. Your ovens require little or no maintenance because Marinite lasts indefinitely. It will never rust, rot or corrode. It is made of asbestos fiber, diatomaceous silica and an inorganic binder. It will not disintegrate even in the most humid, moist conditions. Paint Marinite if you wish—but painting isn't necessary.

MARINITE INCREASES EFFICIENCY Marinite's low conductivity saves fuel and cuts heat loss so effectively that you can gain comfortable extra working space nearer your ovens. There's no through-metal except for a few necessary bolts, and staggered-joint construction keeps your insulating effectiveness high. No "hot-spots" caused by soft insulations that settle and sag—solid Marinite *stays put!*

FIREPROOF MARINITE has Fire Underwriters' approval. For constructing ovens, dryers and other insulated housings—you just can't find a better material than dual-purpose Marinite. Complete information in our Brochure IN-153A. Write to Johns-Manville, Box 14, New York 16, N. Y. In Canada: Port Credit, Ontario.

BENCH TYPE CIRCULAR SAW *makes straight cuts. Use heavy-duty portable power saw for small jobs.*

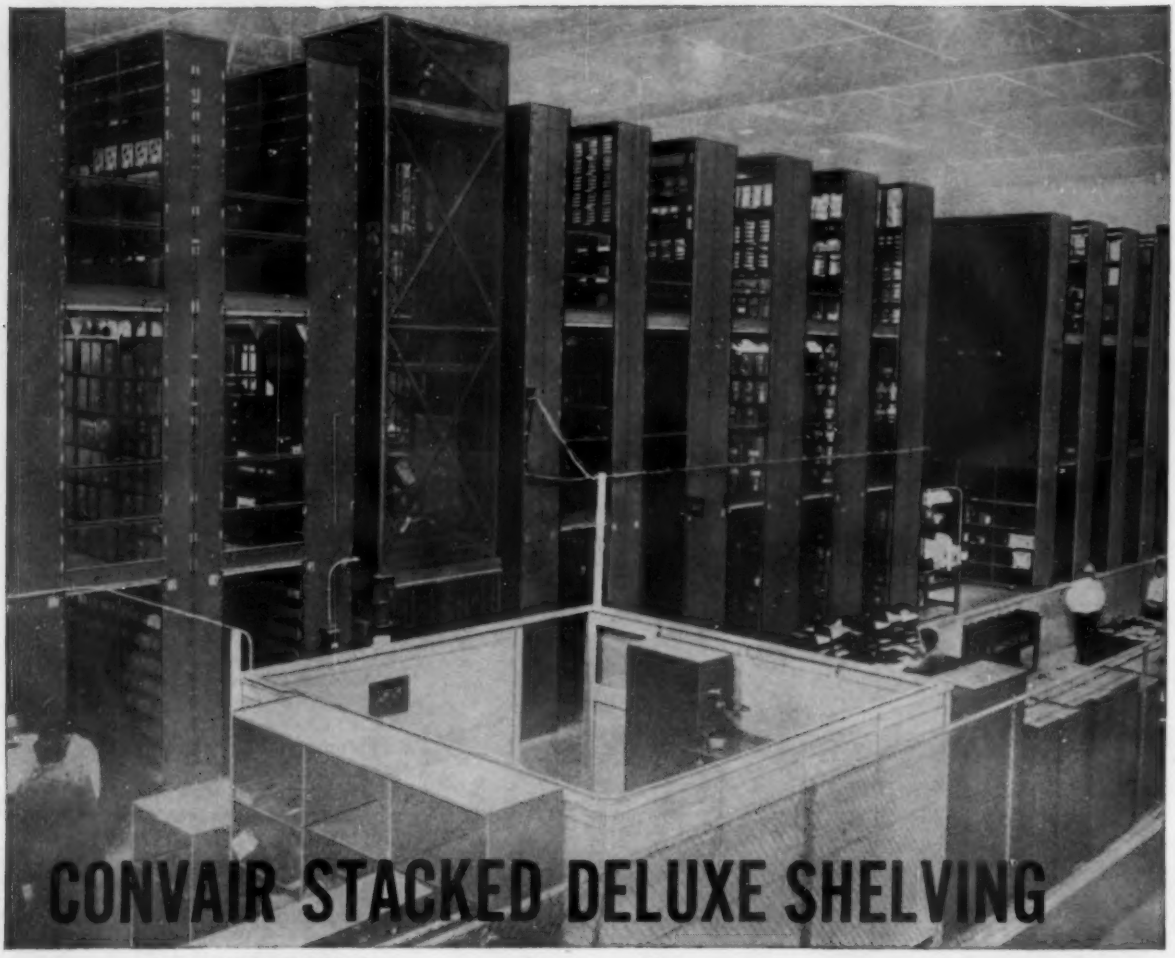
PORTABLE POWER DRILL *and templet insure easy drilling and accurately placed holes.*

CIRCULAR CUT-OUTS AND DISCS *are fly-cut with a radial power drill. Make other cut-outs with portable power saws.*

JOHNS-MANVILLE

AN INSULATION FOR EVERY COMMERCIAL AND INDUSTRIAL USE.

For more facts circle 552 on Reply Card



CONVAIR STACKED DELUXE SHELVING

to save 20,000 square feet of space and $500,000 in parts handling!

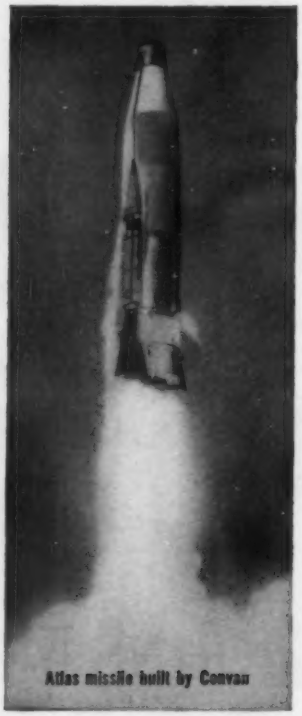
Using a three-level "skyscraper" arrangement of Deluxe steel shelving, Convair compressed 34,000 square feet of valuable *storage* space into 14,000 square feet of *floor* space.

The shelving holds an estimated $11,000,000 worth of vital small missile parts previously stored in a number of different buildings. The tremendous savings resulted from (1) reduction of storage floor space required, (2) elimination of fleet of trucks required for parts transfer, and (3) improved efficiencies in finding and handling parts to production.

This huge installation of Deluxe shelving, 642 standard sections bolted together, is completely self supporting.

The Atlas missile builders stacked Deluxe up against all competitive makes, and chose Deluxe shelving because of its greater strength, faster assembly and better appearance at the lowest installed cost.

For more details on this installation and Deluxe steel shelving, write Deluxe Metal Products Company, Warren, Pennsylvania.



Atlas missile built by Convair

Royal METAL MANUFACTURING COMPANY

DELUXE METAL PRODUCTS CO. DIVISION
WARREN • PENNSYLVANIA

For more facts circle 553 on Reply Card

For more facts circle 554 on Reply Card →

AMERICAN-STANDARD INDUSTRIAL DIVISION AIR-LIFT IN ACTION

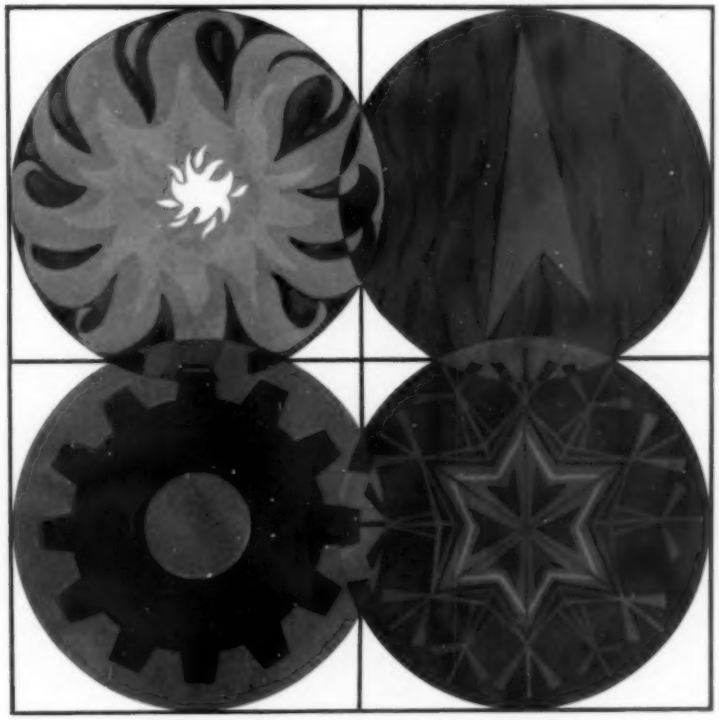
From American-Standard Industrial Division

AIR-LIFT† FOR INDUSTRIAL PLANTS

Air-Lift is a new concept of coordinated products and services from American-Standard Industrial Division. Its purpose: help you lift productivity and profitability of industrial plants through better control of inplant environment. Air-Lift offers one-source responsibility for heating, ventilating, air-conditioning equipment designed and manufactured to work together...with service by product specialists in every major city.

S.

A.



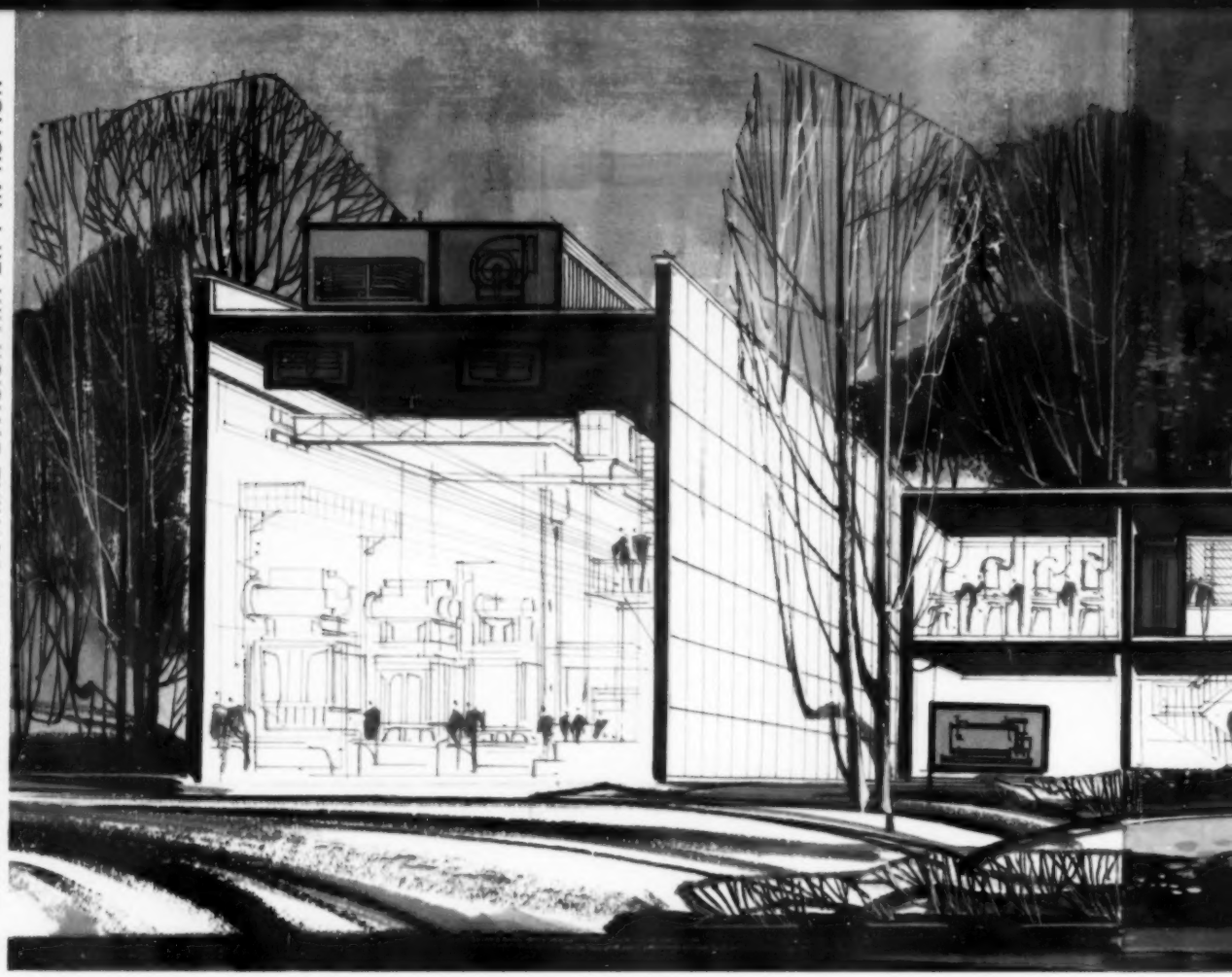
I.

D.

†Service-mark of American Radiator & Standard Sanitary Corporation

lift the flap

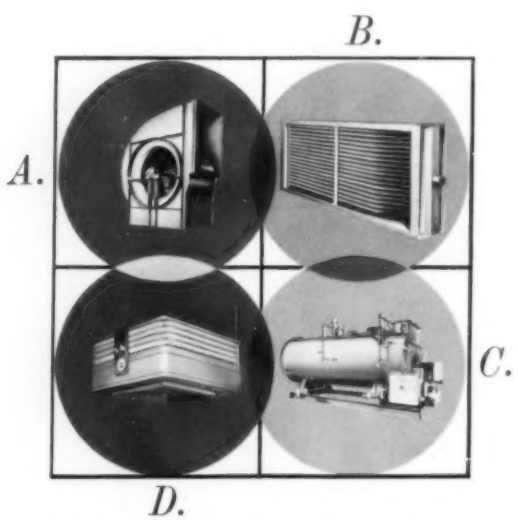
AMERICAN-STANDARD INDUSTRIAL DIVISION AIR-LIFT IN ACTION



Copyright 1960, American Radiator & Standard Sanitary Corporation

YEAR-ROUND CONTROL OF TOTAL PLANT ENVIRONMENT W

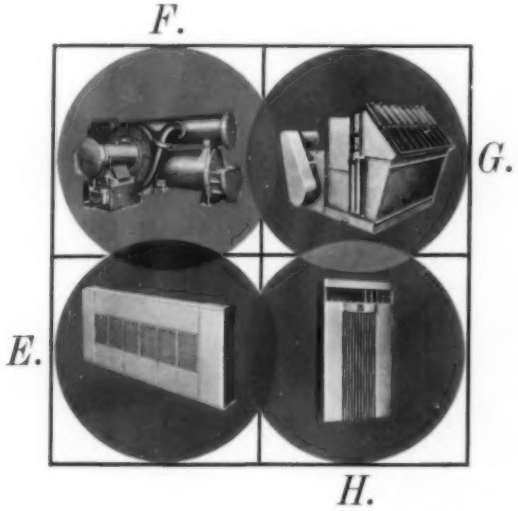
Whatever the plant size, American-Standard Industrial Division can handle the entire job of inplant environment control. And you gain in several ways by working with a single company right from the start. It's more convenient. Fewer interviews save your time. You pinpoint responsibility for delivery, performance, service. You team up with experienced product specialists who can give —and supply you're assure



AMERICAN-STANDARD INDUSTRIAL DIVISION MAKES A COMPLETE LINE OF EQUIPMENT FOR HEATING AND VENTILATING, INCLUDING: FANS (A), HEATING COILS (B), BOILERS (C), UNIT HEATERS (D).

WITH EQUIPMENT FROM A SINGLE SOURCE

n give you the latest developments on everything from fans and boilers to centrifugal refrigerating machines upply information on special equipment, too. And because the individual units are designed to work together, assured of an integrated system. Give your plant an Air-Lift . . . from American-Standard Industrial Division.



EQUIPMENT FOR AIR-CONDITIONING SYSTEMS FOR PLANTS OF ALL SIZES INCLUDE CENTRIFUGAL REFRIGERATING MACHINES (F), MULTI-ZONE (G), PACKAGED (H), AND INDUCTION (E) AIR CONDITIONERS.

AND VENTILATING, INCLUDING: FANS (A), HEATING COILS (B), BOILERS (C), UNIT HEATERS (D).

ONE-SOURCE RESPONSIBILITY . . . the heart of American-Standard Industrial Division's Air-Lift Service. Now—with the combined American Blower, Ross Heat Exchanger, and Kewanee Boiler product lines—American-Standard* Industrial Division offers *all* the major components for complete, integrated systems to control inplant environment. You benefit by getting air-conditioning, air-handling, heating, and air-pollution-control equipment designed, engineered, and manufactured to work together. And you have one-source responsibility for its quality and performance. Offices in all principal cities are staffed by product specialists whose practical knowledge of equipment selection and application may prove most helpful to you. American-Standard Industrial Division, Detroit 32, Mich. In Canada: American-Standard Products (Canada) Ltd., Toronto, Ont. Export Division, American-Standard, New York City.

AMERICAN-Standard
INDUSTRIAL DIVISION

AMERICAN BLOWER PRODUCTS • ROSS PRODUCTS • KEWANEE PRODUCTS

PRODUCTS DESIGNED, ENGINEERED, MANUFACTURED TO WORK TOGETHER

Air conditioning — Centrifugal refrigerating machines Central station units • Fancoil units Self-contained air conditioners • Package water chillers • Multi-zone air conditioners • Sprayed coil dehumidifiers Heating and cooling coils • Air washers

Air handling — Industrial fans with wheel types for handling air, gases, materials, and shavings • Centrifugal, propeller, tubeaxial, and vaneaxial fans • Utility sets Power roof ventilators • Centrifugal compressors • Specialized fans, blowers

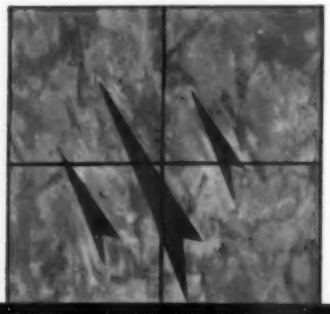
Heating — Firebox, scotch-type steel boilers and package units for heat, process steam Vertical, horizontal unit heaters for steam, hot water • Heavy-duty heating coils • Industrial unit heaters • Heating and ventilating units • Cabinet heaters

Air pollution control — Dust collectors and fly ash collectors for eliminating dust and recovering fly ash Cyclone-type centrifugal dust collectors Disposal systems • Tubular-type centrifugal collectors • Package units Electrostatic precipitators

Power transmission — Gýrol• Fluid Drives for stepless, adjustable-speed control of driven machinery Complete range of sizes, 1 hp thru 12,000 hp • All provide extremely smooth pickup of the load for maximum protection of motor and machine

Heat transfer — Standard and engineered heat exchangers, condensers, and feed-water heaters for every requirement • Oil and gas coolers • Refrigeration condensers and coolers • Instantaneous water heaters for service-water, booster, convertor duty

*American-Standard and Standard® are trademarks of American Radiator & Standard Sanitary Corporation



ERATING MACHINES (F), MULTI-ZONE (G), PACKAGED (H), AND INDUCTION (E) AIR CONDITIONERS.

don't just patch and paint weather damaged masonry ...rebuild it the Thoro way!

Maintenance men everywhere have found that haphazard patching of masonry with inferior products is a costly mistake. The patched areas deteriorate quickly and permanent repairs become more expensive.

Since 1912, Standard Dry Wall Products Company has been in no other business than that of protecting and repairing masonry, and its well-known THORO products are recognized leaders in the field. Before protecting new masonry or old against water seepage or weather erosion, investigate the THORO way. Write for our free specification book.

Before: On a badly weather-damaged building, workman cleans out all loose, deteriorated concrete and removes rust from steel rods to prepare for application of THORO products.

After: Nonshrink, nonslump nonmetallic THORITE has been applied and becomes an integral part of the concrete section. A protective coat of cement-based THOROSEAL completes the waterproof seal.

Standard Dry Wall Products, Inc.
Box X-10 New Eagle, Pa.
Protecting the earth's masonry since 1912

Please send free booklet describing Thoro System protection products and their uses.

Name_____

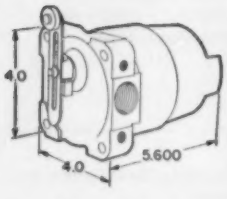
Address_____

City_____ Zone_____

State_____

For more facts circle 555 on Reply Card

"CX" Precision Switch



"CX" Series Switch
A 20 amp. switch. U/L listed for use in hazardous vapor-air and dust-air atmospheres.

Here's a weatherproof answer for outdoor switch applications and a safe answer in hazardous areas where explosions could occur. All exposed parts of the "CX" are treated to resist corrosion and the cast aluminum housing is sealed against driving rain, dry blowing dust, heat and humidity.

The non-sparking nylon roller actuators and the explosion-proof design make the "CX" safe for areas where dangerous gasoline or lacquer solvent vapors, coal or grain dust collect. The lever arm is adjustable through 360° and from one inch to 3½" in length.

The "CX" contains two single-pole, double-throw switching units, each operated by opposite movements of the roller arm. You can depend on it for rugged switch jobs with hard mechanical service or heavy electrical loads. Don't take chances with explosion hazards. Write for Data Sheet 156 on the weatherproof, explosion-proof "CX" precision switch or call the nearby MICRO SWITCH branch office listed in the Yellow Pages.

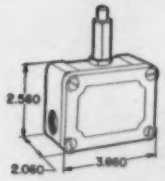
75th YEAR HONEYWELL PIONEERING THE FUTURE

Don't Risk Explosions in Hazardous Areas!

Many different explosion-proof switches are available in the MICRO SWITCH line to help make your plant safer. The nearby branch office or distributor can recommend the right model for performing limit, safety or interlock functions in hazardous areas where dust or vapors might explode. These switches can also cut costs with their automatic control. Be sure of precision and reliability by calling the MICRO SWITCH man. Here are three representative series in the MIRCO SWITCH line of explosion-proof switches:

"EX-AR" Series. These are the smallest explosion-proof switches available. They are rated at 15 amperes and have a roller-arm actuator. Operating force is only ½ to 1¼ lb.

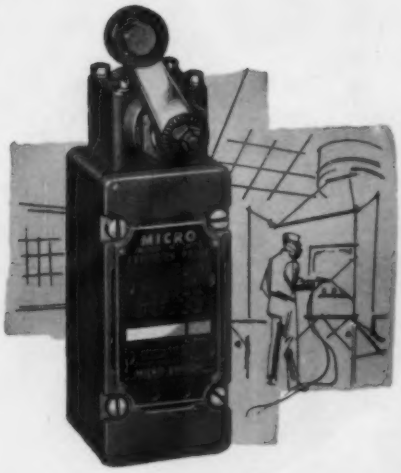
"EX-Q" Series. Rated at 15 amperes and small enough for mounting in cramped installations. Explosion-proof in atmospheres where dust or vapors are a problem. Equipped with a plunger actuator that will withstand a steady load of 100 pounds without injury to the enclosed switching unit. Operating force: 3 lbs. max.

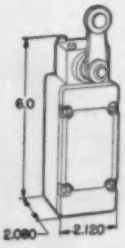


EX-Q (above) has same dimensions as EX-AR.

"EX-AR"

Other "EX" Switches are available with cross-roller lever actuators and manual types. Different operating characteristics and contact arrangements are available to fit varying applications.





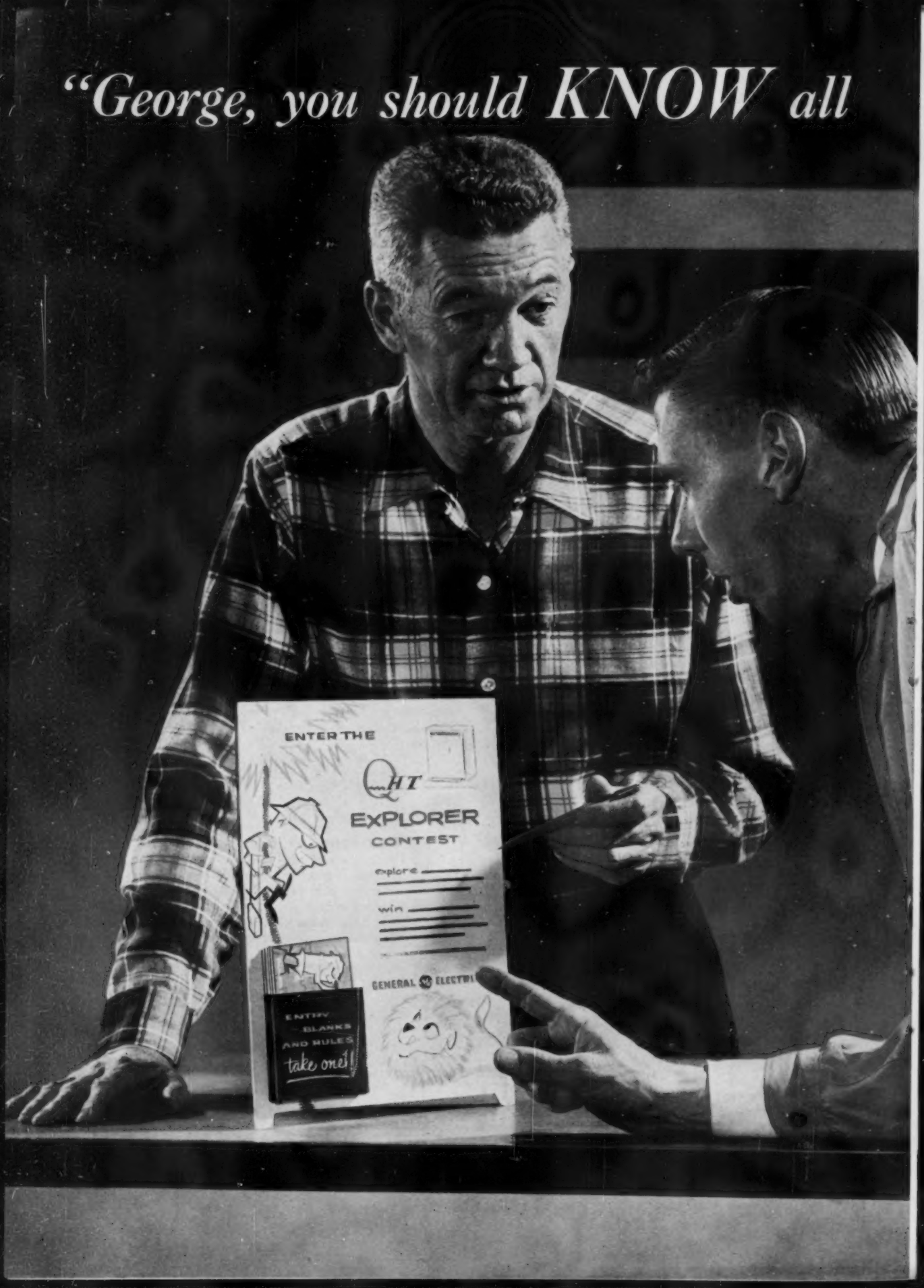
"ML-E1" Series. The operating head on these switches is specially sealed against dust and abrasives, perfect for industrial applications where this kind of atmosphere is a problem. Four actuator designs available: low-force rod; roller lever; in-line plunger and roller plunger. These switches are rated at 20 amperes.

Write for Catalogs 83 and 84 on explosion-proof switches.

MICRO SWITCH . . . FREEPORT, ILLINOIS
A division of Honeywell
In Canada: Honeywell Controls Limited, Toronto 17, Ontario

Honeywell
MICRO SWITCH Precision Switches

For more facts circle 556 on Reply Card


"George, you should KNOW all
ENTER THE
QHT
EXPLORER
CONTEST
explore
win
GENERAL ELECTRIC
ENTRY BLANKS AND RULES
take one!

the features of these QHT dry-types"*

. . . that's right, KNOWING the features of QHT dry-type transformers means satisfaction, can save time and money, and may win you a vacation of your choice in New York, Miami, Las Vegas, or Los Angeles.

General Electric QHT dry-type transformers provide a balanced combination of small size, light weight, superior installation features, high-temperature insulation, and quiet operation. This combination means easier installation and practically eliminates the major sources of transformer complaints—noise and insulation failure. Review these features:

Ease of installation. These General Electric QHT dry-types are built with convenient conduit knock-outs, large terminal compartments, and wiring spaces which are easily accessible from the front. You'll save time and money every time you install one.

Quiet, high-temperature operation. All QHT transformers have sound levels equal to or less than NEMA Standards. The rigid, welded design of the units helps eliminate vibration, and built-in rubber mountings reduce noise transfer through conduits and mounting brackets. QHT dry-types have silicone-impregnated insulation, highly moisture resistant, with an inherent ability to withstand high operating temperatures.

Small size, light weight. Because these new QHT dry-type transformers are built of quality, weight-saving materials such as aluminum conductors and cold rolled, grain-oriented silicone steel, you get a unit that's lighter and smaller than old type designs. You'll save space and money in installation by putting these new transformers right at the load.

Fast delivery. Complete stocks of these new General Electric QHT dry-type transformers are available at your local G-E electrical distributor. See him today for all the information on what these QHT features mean to you. And ask him for details on the "QHT EXPLORER CONTEST"—he'll give you all the details and an entry blank.

*Registered Trademark of General Electric Co.

announcing the

QHT *dry-type transformer*

EXPLORER CONTEST

. . . You can win a vacation for two in your choice of New York, Miami, Las Vegas, or Los Angeles, or one of 1400 other prizes, simply by exploring the world of extra values in General Electric QHT dry-type transformers. Call your G-E dry-type transformer distributor and ask him for details on the "QHT EXPLORER CONTEST"—he'll give you all the details and an entry blank. 411-14

No entries will be accepted from employees of the General Electric Company or its subsidiaries.

GENERAL ELECTRIC

For more facts circle 557 on Reply Card

You find Gates Hose where anything flows. The Rich-

CRANES *SPEED* PALLET-HANDLING

Store More—Eliminate Congestion—Cut Maintenance—Save Floors

Pallets loaded with motor stator laminations are easily lifted and moved with these floor-operated Tramrail cranes. Note that the entire area is jam-packed, with no lost aisle-way space. The ease with which any loaded pallet can be picked up and handled to awkward-to-reach places is a distinct advantage.

Pallets with 32 100-lb. kegs of nails are piled high in storage with the cab-operated Tramrail crane and open-side pallet lift.

THERE'S no height limit when stacking palleted materials with Tramrail cranes. 20 ft.—30 ft.—40 ft. or higher are easy. Your materials and building are the only limiting factors.

Often 50% and more materials on pallets can be stored in a room served by overhead cranes. Narrowing of some aisles, elimination of others, plus higher and closer piling make the difference.

Pallet loads are moved safely and speedily overhead where the path is always clear and unobstructed. Placing this handling job near the ceiling, reduces floor congestion and frees much of it for other purposes.

Maintenance costs for Tramrail cranes are extremely low, usually only a few percent of that for power-operated floor trucks. No engines to overhaul. No clutches to replace. No brakes to re-line. No batteries to charge. No irritating gas fumes. And of importance, extra heavily reinforced floors are not required and costly floor damage because of materials handling is eliminated.

When considering pallet handling or any materials handling, it will pay you to look into the tremendous advantages that Cleveland Tramrail cranes offer.

GET THIS BOOK!

BOOKLET No. 2008. Packed with valuable information. Profusely illustrated. Write for free copy

CLEVELAND TRAMRAIL DIVISION

THE CLEVELAND CRANE & ENGINEERING CO.

7578 EAST 284TH ST., WICKLIFFE, OHIO

CLEVELAND TRAMRAIL

OVERHEAD MATERIALS HANDLING EQUIPMENT

For more facts circle 558 on Reply Card

For more facts circle 559 on Reply Card →

For more facts circle 557 on Reply Card

You find Gates Hose where anything flows. The Richardson "46" Motor Yacht, made by the Richardson Boat Company of Tonawanda, New York, uses Gates 19-B All Purpose Hose and Engine Coolant Hose on each of its twin marine engines.

Dependable Gates Hose
makes for "cool" cruising

Whether it's for air, water, steam, oil or suction, there is a Gates Hose of the right type and size for the continued safe performance of all types of equipment—at sea, on land, or in the air.

Back of the world-wide acceptance of Gates Hose is a continuing program of specialized hose research at the multi-million dollar Gates Research Center. The aim of this program is to broaden the usefulness and lengthen the life of hose for all industries.

Distributors of Gates Industrial Hose are listed in the Yellow Pages of phone books in all major industrial centers. Performance of this product is guaranteed by the *World's Largest Maker of V-Belts.*

Gates Type 19-B Hose carries air, water, coolants, oils, greases, gasoline, kerosene, or solvents. This popular hose—one of many in Gates full line—is always available from your nearby Gates Distributor.

The Mark of *Specialized* Research

Gates

The Gates Rubber Company • Denver, Colorado

Gates Rubber of Canada Ltd., Brantford, Ontario

TPA 471

Gates Industrial Hose

Made in a Full Range of Types and Sizes

Reynolds Aluminum Rigid Conduit LOWERS INSTALLATION COSTS

Here's why: Reynolds Aluminum conduit bends and forms easily and accurately. And, because aluminum is so lightweight—weighing one-third as much as steel, it can be handled and installed easily. Important to everyone concerned with maintenance is the fact that aluminum can't rust ever—and also resists corrosion due to weather and most industrial atmospheres. Even threads cut on the job can't rust.

Reynolds Aluminum Rigid Conduit is non-magnetic, reduces voltage drop, makes longer runs or smaller conductors possible.

For complete information and names of Reynolds Aluminum Rigid Conduit distributors, call your Reynolds Sales Office or write *Reynolds Metals Company, Box 2346-ER, Richmond 18, Va.*

Watch Reynolds TV shows "ADVENTURES IN PARADISE", "BOURBON STREET BEAT" and "ALL STAR GOLF"—ABC-TV

For more facts circle 560 on Reply Card

For more facts circle 561 on Reply Card →

Made in a Full Range of Types and Sizes

A beauty of a buy!

Whisper-quiet . . . extra power . . . wet or dry . . . light weight super capacity . . . you have your choice of all these *plus* in Black & Decker's vacuum cleaner line. The *plus* is a new heavy-duty, high-styled beauty that mounts on a pole, a wall, in bays—so light you can carry it with ease. The new No. 25 is designed especially for motels, hotels, offices, service stations and industry. Quietest commercial vacuum on the market. Priced to make it a real beauty of a buy from

Black & Decker®

Black & Decker Heavy Duty Vacuum Cleaners designed to suit your every need

Capacity plus Power . . . No. 95

Super-Capacity Cleaning . . . No. 55

Take the new No. 25 Heavy-Duty, for example. Here's *whisper-quiet* cleaning in a new concept of industrial vacuuming. The 25's swivel top permits cleaning a 15′ circle without moving the vacuum. And when the job's done just throw away the disposable bag! With power to spare the No. 25 is the most compact heavy-duty vacuum on the market.

Other models, ideal for general office, factory and furnace room use, are the No. 35 (⅞ bushel capacity); No. 65 for wet and dry cleaning; No. 95 for extra capacity and power. No. 55 for super capacity (50 gallons); and No. 648, designed for efficient furnace cleaning.

Whatever your cleaning needs call on B&D power, capacity, quietness. See the line soon. Mail coupon for free demonstration.

See Tools-Electric -Yellow Pages-for Service & Sales

THE BLACK & DECKER MFG. CO., Dept. 0807
Towson 4, Maryland (In Canada: Brockville, Ont.)

☐ Please arrange a demonstration of _____

☐ Please send additional information on _____

Name _____ Title _____

Company _____

Address _____

City _____ Zone _____ State _____

☐ Drills ☐ Saws ☐ Scrugun® ☐ Belt Sanders

50th YEAR

Leading Distributors Everywhere Sell

Black & Decker

QUALITY ELECTRIC TOOLS

CONSTRUCTION BRIEFS —a review of fundamentals for the plant engineer

Prepared by B. A. Wasil, Structural Engineer

DESIGN OF A BRIDGE BETWEEN BUILDINGS

This Brief is the first of several individual design problems. This problem involves the structural design of a pedestrian bridge between two buildings.

For the most part, the principles of design have been developed in previous Briefs. Where new design ideas are introduced, they will be explained in the Brief.

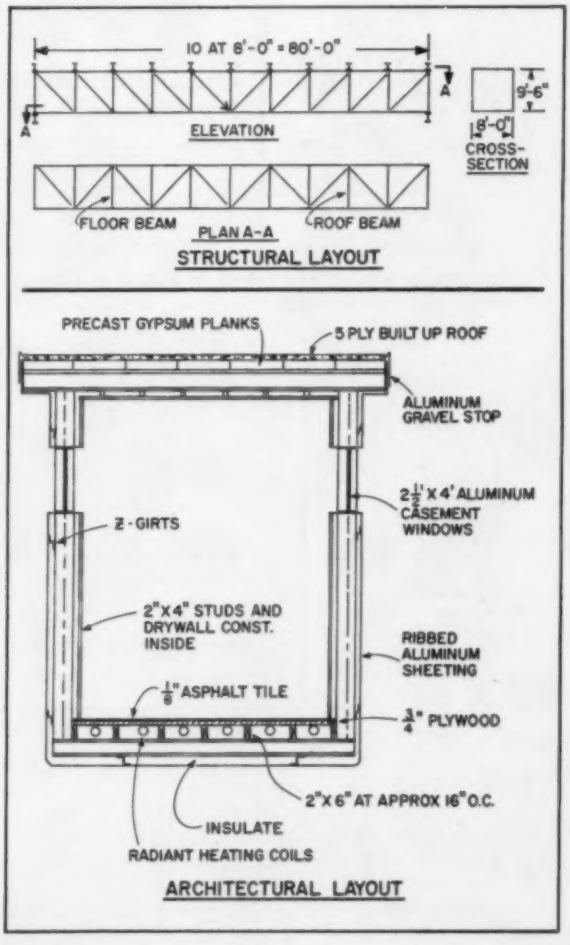
To connect two buildings separated by a city street, a plant engineer is to design an all-weather pedestrian bridge, spanning 80 ft. City approval requires that the bridge be attractive, level, and have a minimum clearance of 14 ft, 2 in. A two-foot difference in elevation between the floors of the two buildings connected by the bridge requires that steps be incorporated in the bridge, at one end.

Alterations required in each building to accept and support the bridge will not be shown in this Brief.

Design

Governing Data

1. Preliminary sketches



2. Live Loads

Inside the bridge	100 lb per sq ft
Roof or snow load	25 lb per sq ft
Wind load	20 lb per sq ft

3. Design specifications

AISC specifications for the design, fabrication and erection of structural steel for buildings.

4. Type of connections

All welded

I. Design of Roof Beam

1. Loads

Live:		8 x 25	200 lb per sq ft
Dead:	Roofing, including gravel	8 x 8	64
	Gypsum	8 x 20	160
	Roof beam and bracing		16

2. Moment

$$M = \frac{440 \times 8^2}{8} = 3520 \text{ ft-lb}$$

3. Section modulus required:

$$S = \frac{3520 \times 12}{20{,}000} = 2.11 \text{ in.}^3$$

Although a lighter member would be satisfactory, we shall limit the thinnest part of any member to 3/16 in. Therefore use 417.7 beam; S = 3.0 in.³

II. Design of Floor Beam

1. Loads

Live:		8 x 100	800 lb per ft
Dead:	Tile, plywood and lumber	8 x 8	64
	Siding material	8 x 1	8
	Beam, girts and bracing		18
			890 lb per ft

2. Moment:

$$M = \frac{890 \times 8^2}{8} = 7120 \text{ ft-lb}$$

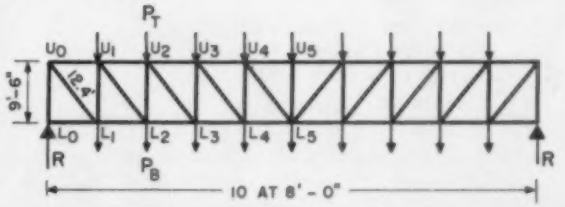
3. Section modulus required:

$$S = \frac{7120 \times 12}{20{,}000} = 4.27 \text{ in.}^3$$

Use 5I10.0 beam; S = 4.8 in.³

III. Design of Wall Trusses

1. Loads



In computing the loads of the truss and siding and inside wall construction it will be assumed that one-third will

apply on the top and two-thirds will apply on the bottom.

P_T:

From the roof	440 x 4	1760 lb
Siding	⅓ (8 x8)	21
Truss and girts	⅓ (17 x 8)	45
		1826 lb

Use P_T = 1830 lb

P_B:

From the floor	890 x 4	3560
Siding	⅔ (8 x 8)	42
Truss and girts	⅔ (17 x 8)	90
		3692 lb

Use P_B = 3700 lb

R = 4.5 (1830 + 3700) = 24,900 lb.

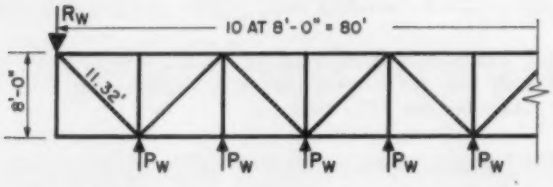
2. Design of members

Member	Force (kips)	Size of Member	Area sq. in.	Actual stress, psi	l/r	Allowable stress, psi
Bottom chord	+55.9	ST 5 WF 10.5	3.10	18,000	76.8	20,000
Top chords	—58.2	ST 5 WF 14.5	4.27	13,630	71.6	14,520
Verticals	—24.9	2 angles 3 x 2½ x ¼	2.62	9,500	120.0	10,020
Diagonals	+31.4	2 angles 2¼ x 2 x 3/16	1.62	19,400	182.3	20,000

The top and bottom chords are tentatively designed. They will now be checked for the effect of wind.

IV. Design of Top and Bottom Wind Bracing

1. Loads:



$$P_W = \frac{1}{2} \times 8 \times 20 \times H$$

where H = exposed height of structure

Assume H = 11.5 ft., then

P_W = 920 lb

R_W = 920 x 4.5 = 4130 lb

2. Maximum member stresses

Chords: ± 11,500 lb

Floor or roof beams: —920 lb

Wind bracing: ± 5850 lb

3. Design of Wind Bracing

Since each of these members may be in tension or compression, depending on the direction of the wind, they shall be designed for the more critical stress, compression. Bracing or secondary members are permitted to have l/r ratios up to 200. The allowable stress may be 33⅓ per cent greater than those specified for dead and live load stresses.

Therefore use a single angle,

3½ in. by 3½ in. by ¼ in.

A = 1.69 sq in., r = 0.69 in.

$\frac{l}{r} = \frac{11.32 \times 12}{0.69} = 197$; actual stress $= \frac{5850}{1.69} = 3460$ psi

Allowable stress = 1.333 x 5700 = 7600 psi. Angles are OK.

4. Check on chords

The bottom chord of the wall truss is increased to a force of 67.4 kips.

Actual stress = 21,700 psi

Allowable stress = 1.333 x 20,000 = 26,700 psi. OK

The top chord of the wall truss is increased to a force of 69.7 kips.

Actual stress = 16,330 psi

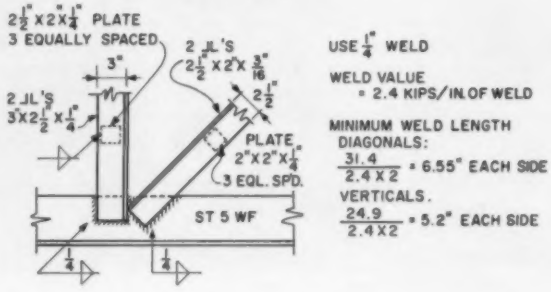
Allowable stress = 1.333 x 14,520 = 19,370 psi. OK

5. Check on additional wind stresses in floor and roof beams.

The loads are so light that they do not affect the design of these members.

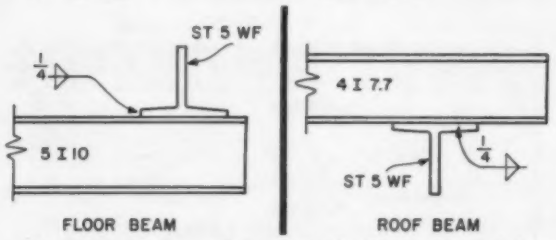
V. Design of Welded Connections

1. Typical wall truss connection



2. Roof beam to wall truss connection

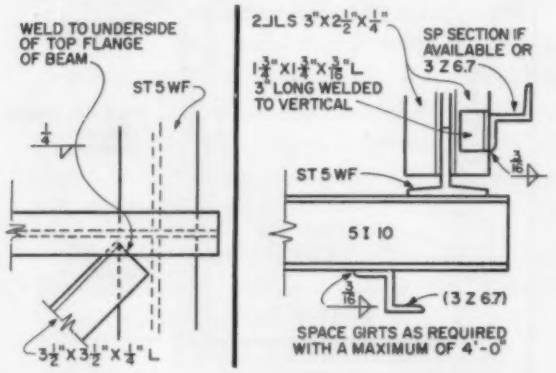
3. Floor beam to wall truss connection



The type of connection shown in Fig. 2 is used here to avoid overhead welding.

4. Wind brace to roof or floor beam connection

5. Detail of Girts


WELD TO UNDERSIDE OF TOP FLANGE OF BEAM
ST 5 WF
¼
3½" x 3½" x ¼" L
2 JLS 3" x 2½" x ¼"
SP SECTION IF AVAILABLE OR 3 Z 6.7
1¾" x 1¾" x 3/16" L
3" LONG WELDED TO VERTICAL
ST 5 WF
3/16
5 I 10
3/16
(3 Z 6.7)
SPACE GIRTS AS REQUIRED WITH A MAXIMUM OF 4'-0"

VI. Summary

It is anticipated that the chords of the wall trusses will require a splice. Location of the splice and whether it shall be a field or shop splice will be left to the discretion of the fabricator.

In either case, the fabricator shall be expected to provide a full butt splice.

recipe for profit ▶
the Westinghouse recipe for motor controls gives you reserve capacity reliable operation matched to the job performance!
YOU CAN BE SURE IF IT'S Westinghouse

TESTED RECIPES FOR PROFIT . . .

the blending of ingredients in Westinghouse controls meets today's demands for profitable production

Combine advanced design ability and modern manufacturing facilities . . . fold in select materials and quality components. Mix in years of research and experience. Spice as required with superior application and engineering assistance. Baste with outstanding quality control until mixture attains perfection. Garnish with nationwide repair facilities.

That's the Westinghouse control recipe. But just as a chef's deft touch is the final element needed to turn fine ingredients into an epicurean triumph, so a generous portion of Westinghouse experience and know-how blends superior control ingredients. Result: **more control value for your money** — reserve capacity to handle **overloads** . . . long, trouble-free service . . . and apparatus performance matched **perfectly** to your needs. Hidden qualities that distinguish Westinghouse **controls** . . . and your best insurance against costly down time.

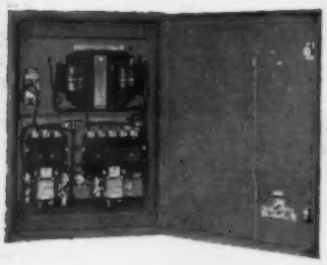
Westinghouse makes a wide range of outstanding industrial motor controls. Ask your local Westinghouse representative to explain all their **hidden values** . . . benefits by the baker's dozen . . . for more profitable plant operations. He'll be glad to assist you in applying Westinghouse controls.

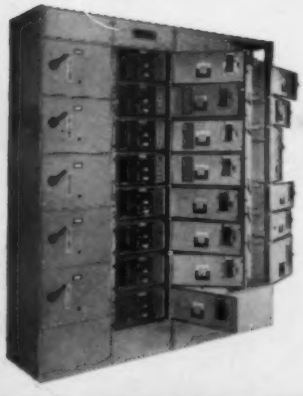
Westinghouse Electric Corporation, P. O. Box 868, Pittsburgh 30, Pennsylvania.

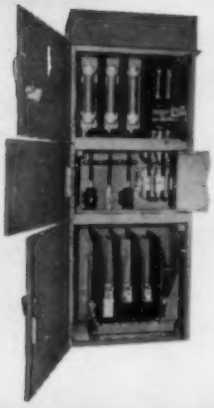
YOU CAN BE SURE...IF IT'S Westinghouse

TUNE IN WESTINGHOUSE-CBS TV-RADIO COVERAGE, PRESIDENTIAL CONVENTIONS, JULY 10-29

Just ask any gourmet. Good ingredients alone don't guarantee an epicure's delight. It takes years of experience to convert a basic recipe into a blue ribbon winner. So, too, with superior electrical products.







Ampgard* High-Voltage Starters

Maximum protection for motors, systems and personnel.

Faults interrupted in less than ½ cycle . . . isolates fault to prevent shutdown of other equipment.

Completely front accessible.

Externally operated line isolating switch.

Exclusive mechanical and electrical interlock . . . prevents switch operation under load; automatically stops motor when cabinet is open.

Full line available . . . for squirrel-cage, wound-rotor and synchronous motors up to 3000 hp — up to 5000 volts.

* Trade-Mark

Reduced Voltage Starters

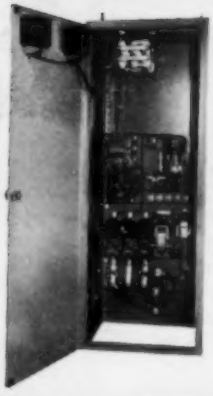
Widest possible selection of primary resistor, auto-transformer, part-winding and star-delta types for squirrel-cage, wound-rotor and synchronous motors in all hp ratings — up to 600 volts.

Manual and magnetic starters to provide the proper starting characteristics for any application.

Available with integral circuit breaker or disconnect switch — fused or non-fused.

Enclosures available for every need . . . general purpose . . . dust-tight industrial . . . watertight . . . explosive atmospheres.

Available for immediate delivery.



Static Slipsyn® Synchronous Motor Control

Static transistor circuit guarantees . . . maximum reliability and accuracy; no moving parts to wear, corrode or fail; unaffected by contaminated atmosphere.

Motor field excitation applied at precise speed and pole position.

Adjustable pull-out protection, permits immediate detection or delays action to eliminate false tripping caused by transients.

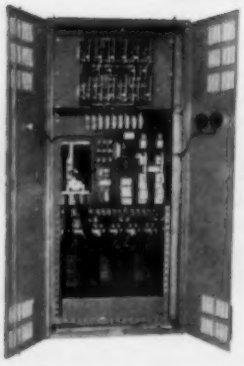
Available as complete starter or field conversion unit for **any make** control!

Control Centers

Compact grouping of all motor controls cuts installation time; frees production areas; permits easy one-man control supervision; speeds maintenance and service.

Interchangeable modular construction.

DESIGN TESTED AND VERIFIED in the Westinghouse HIGH POWER LABORATORY



D-C Packaged Power Supplies

Ideal for cranes, elevators, magnetic chucks, etc.

"Packaged" units, including control, are ideal for "on-the-spot" conversion of a-c to d-c, eliminating long line voltage drops.

Lower first cost, lower installation cost than motor-generator set.

Require approximately 67% less floor space, weigh less than half of equivalent motor-generator set.

Completely static units — essentially maintenance-free.

Hermetically sealed silicon cells prevent contamination of the rectifier; no apparent aging assures years of trouble-free service.

Flintkote salesman Bill Schrand says...

"No matter what rolls through the plants you design– Flintkote's new Super Tuff-Tex® floor tile can take it!"

"There's no doubt about one thing: a better looking plant means a more efficient plant. And good looks start with a good looking floor. Your problem is to find an attractive floor that will keep its good looks throughout the years with minimum maintenance costs.

"Well, that's one problem you won't have to worry about if you install Flintkote's new Super Tuff-Tex floor tile in your plant. Tuff-Tex was developed specifically for industrial use. And it has stood the toughest tests over and over again. New Super Tuff-Tex is even better. It is a heavy-duty tile, strengthened with Asbestos — nature's permanent fiber. As a result, these tiles have greater strength— can shrug off plant traffic, including an amazing amount of trucking abuse— and roll with the punches from dropped objects.

"As for upkeep, Super Tuff-Tex is greaseproof, withstands oils, too. Its close-textured surface makes maintenance easier and economical. And, of course, Super Tuff-Tex is fire resistant.

"What about good looks? This year, Flintkote is introducing eight new, attractive colors. As you would expect from Super Tuff-Tex, the colors and marbleization go all the way through the tile, for long lasting beauty in your plant."

FLINTKOTE

TILE-TEX PRODUCTS

For particulars and literature, see your local Flintkote Flooring Contractor. You'll find him a great guy to work with; and he knows his stuff in flooring materials.

The Flintkote Company, Flooring Division, 30 Rockefeller Plaza, New York 20, New York

For more facts circle 563 on Reply Card

← **For more facts circle 562 on Reply Card**

Just 24 minutes with this movie can save hundreds of man-hours in your plant

If you're concerned with cost control, don't miss Texaco's movie about grease, called "Shear Magic."

There's no hard sell in "Shear Magic." It's devoted entirely to helpful information on ways to cut the cost of maintenance and prevent unscheduled downtime.

A well-planned grease schedule can extend equipment life and cut repair costs and you can bring this message home to your maintenance men by having them see "Shear Magic." This movie suggests ideas for planning the grease schedule that best fits your operation. And it reminds the men that properly choosing and applying greases helps their company, because it assures tighter control of maintenance costs.

A Texaco Lubrication Engineer will be glad to arrange a showing of this full-color film in your plant. Or, if you wish, send for the informative Texaco booklet called *A Grease Schedule for Cost Control*. For quick action, mail the coupon today.

Texaco Inc.
Dept. E-G-31
135 East 42nd Street
New York 17, N. Y.

☐ Please send me more information about a free showing of "Shear Magic" to my organization.

☐ Please send me a copy of *A Grease Schedule for Cost Control.*

Name_____

Company_____

Address_____

City_____ State_____

LUBRICATION IS A MAJOR FACTOR IN COST CONTROL

For more facts circle 564 on Reply Card

For more facts circle 562 on Reply Card

AT THE HEART OF ALL GOULD MOTIVE POWER BATTERIES

the vital new *SILCONIC* plate

Increases battery life 25% by preventing grid corrosion, the most common cause of battery failure.

Here's the principle: Gould introduces silver and cobalt into active materials of the positive plates. The silver and cobalt migrate to—and collect on—positive grid members, forming an insoluble oxide surface impervious to acid and oxygen attack. The longer the battery operates, the deeper the silver-cobalt penetrates into the grid metal, thus greatly prolonging life. In applications where batteries are idle for periods of time, Gould's Silconic Plate prevents migration of materials to the negative plate, effectively reducing self-discharge within the cell.

Further overall strength is achieved when arsenic is added to the antimonial alloy of the plate, resulting in an extremely dense, homogeneous grid free of flaws. This new physical and chemical strength—together with Gould's compact battery design—add up to the best motive power battery you can buy. Write today or call your local Gould representative. He's listed under "Batteries—Industrial" in the Yellow Pages. Gould-National Batteries, Inc., Trenton 7, N. J. *IN CANADA, WRITE TO GOULD-NATIONAL BATTERIES OF CANADA, LTD., 1819 YONGE STREET, TORONTO, ONTARIO.*

More Power to you from **GOULD**

For more facts circle 565 on Reply Card

For more facts circle 566 on Reply Card →

Deepfreeze Appliances, Division of Motor Products Corporation. Glazed with approximately 10,000 sq. ft. Hammered Coolite, Glare Reduced on pattern side only. Design and construction by The Austin Company. Waukegan Glass Company, Waukegan, Illinois, Glazing Contractor.

IN *Better* BUILDINGS EVERYWHERE

Today's leading architects are taking fullest advantage of translucent glass. As a result, their outstanding buildings enjoy more and better daylighting per glazing dollar. And figured glass promotes truly functional architecture adapted to today's needs . . . offers a dramatic texture that enhances the appearance of any structure.

Cutler-Hammer, Inc., Lincoln, Illinois. Another award-winning structure in which 13,500 sq. ft. of Coolite, Glare Reduced one side has been installed to daylight adequately the plant of this pioneer electrical manufacturer. Design and construction by The Austin Company.

Square D Company Plant on Goodhope Road, Glendale, Wisconsin. 240 lights of 30" x 60" Coolite Heat Absorbing Glass are glazed around the top rim of the building. Architect: Grassold-Johnson & Assoc., Milwaukee, Wisconsin. Glazing: Pittsburgh Plate Glass Company, Milwaukee, Wisconsin.

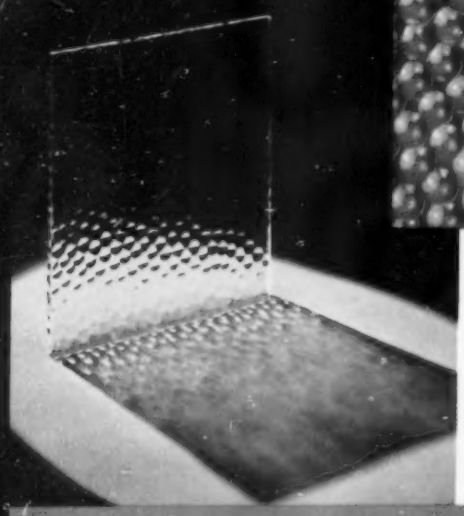
SEE OTHER SIDE

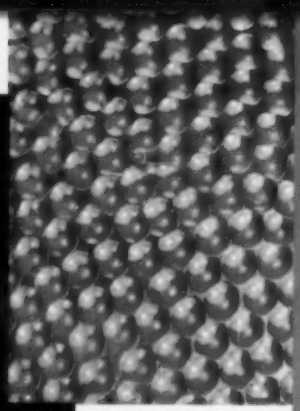
MISSISSIPPI GLASS COMPANY

88 Angelica Street • St. Louis 7, Mo.

NEW YORK • CHICAGO • FULLERTON, CALIFORNIA

HAMMERED

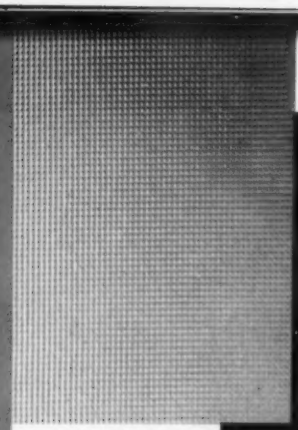




PATTERN ACTUAL SIZE

Available in thicknesses of ⅛", 7/32", and ¼" wired (Hexagonal Mesh)—also ¼" Misco (wired) untreated or glare reduced on one or both sides.

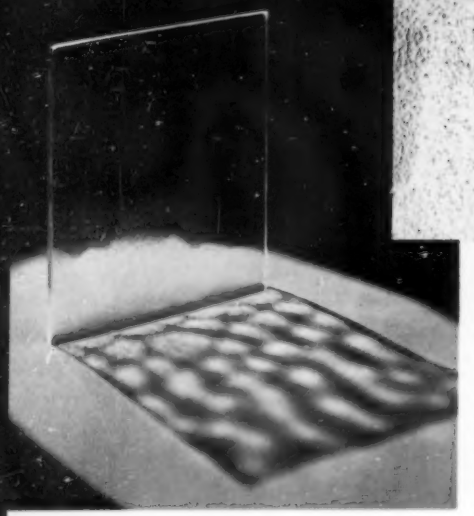
FACTROLITE



PATTERN ACTUAL SIZE

Available in thicknesses of ⅛", 7/32", and ¼" wired (Misco Wired only). Untreated or glare reduced on one or both sides.

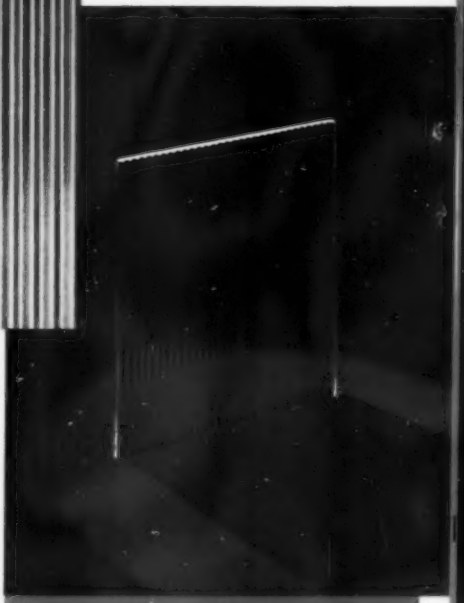
SMOOTH ROUGH®

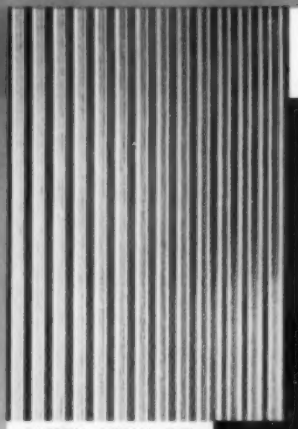


PATTERN ACTUAL SIZE

Available in thicknesses of ⅛", 7/32", ⅜", and ¼" wired (Hexagonal mesh on Pacific Coast only)—also ¼" Misco (wired) untreated or glare reduced on 2 sides only.

PENTECOR





PATTERN ACTUAL SIZE

Available in thicknesses of ⅛", 7/32", and ¼" wired (Hexagonal Mesh). Untreated or glare reduced on one or both sides.

For utility, beauty, and variety unmatched by any other glazing medium, specify Mississippi Glass. Available in a wide variety of patterns, wired and unwired, at better distributors everywhere.

NEW CATALOG

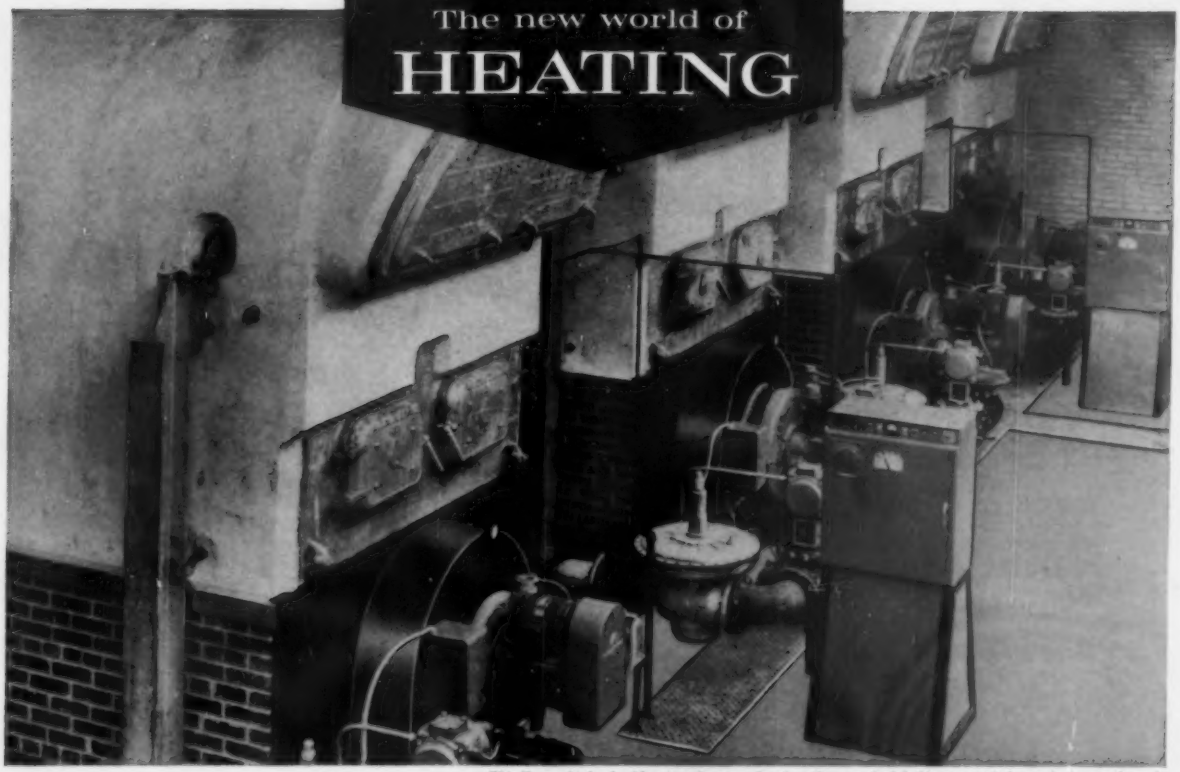
Contains pattern descriptions, light distribution charts, transmission data. Send for your free copy today.

MISSISSIPPI GLASS COMPANY

88 Angelica St. • St. Louis 7, Mo.

NEW YORK • CHICAGO • FULLERTON, CALIFORNIA

The new world of
HEATING



This Kansas high school heating plant uses four Iron Fireman dual-fuel burners with factory-built control panels.

Add high efficiency firing *without boiler alteration*

Factory engineering replaces local "cut and try" firebox design

The Iron Fireman AirRing* dual-fuel burner (shown in the high school heating plant above) is a complete factory built package that is simply bolted to the boiler front.

The package includes both primary and secondary air systems, combustion safety controls, ignition and fuel systems for either one or two fuels, and factory engineered refractory combustion throat.

This compact unit not only reduces on-the-site construction, but achieves superior performance by supplementing local craftsmanship with experienced application engineering. Complete combustion is accomplished without flooding the firebox with excess air.

This cutaway shows how oil, gas and air are introduced into the combustion chamber through a single firing port. No checkered floor, firing arch or boiler pit. Flame is generated within a cone of air—no inefficient infusion of underfloor air.

*Trade-Mark

Mail coupon for full information and specifications.

IRON FIREMAN

HEATING AND AIR CONDITIONING
AIRCRAFT COMPONENTS AND EQUIPMENT
MISSILE AND AIRPLANE GYROSCOPES
ELECTRONIC EQUIPMENT
CONTROL INSTRUMENTS

Iron Fireman Mfg. Co., 3067 W. 106th St., Cleveland 11, Ohio
(In Canada, 80 Ward St., Toronto)

Please send complete technical description and specifications on Iron Fireman AirRing firing.

Name_____

Firm_____

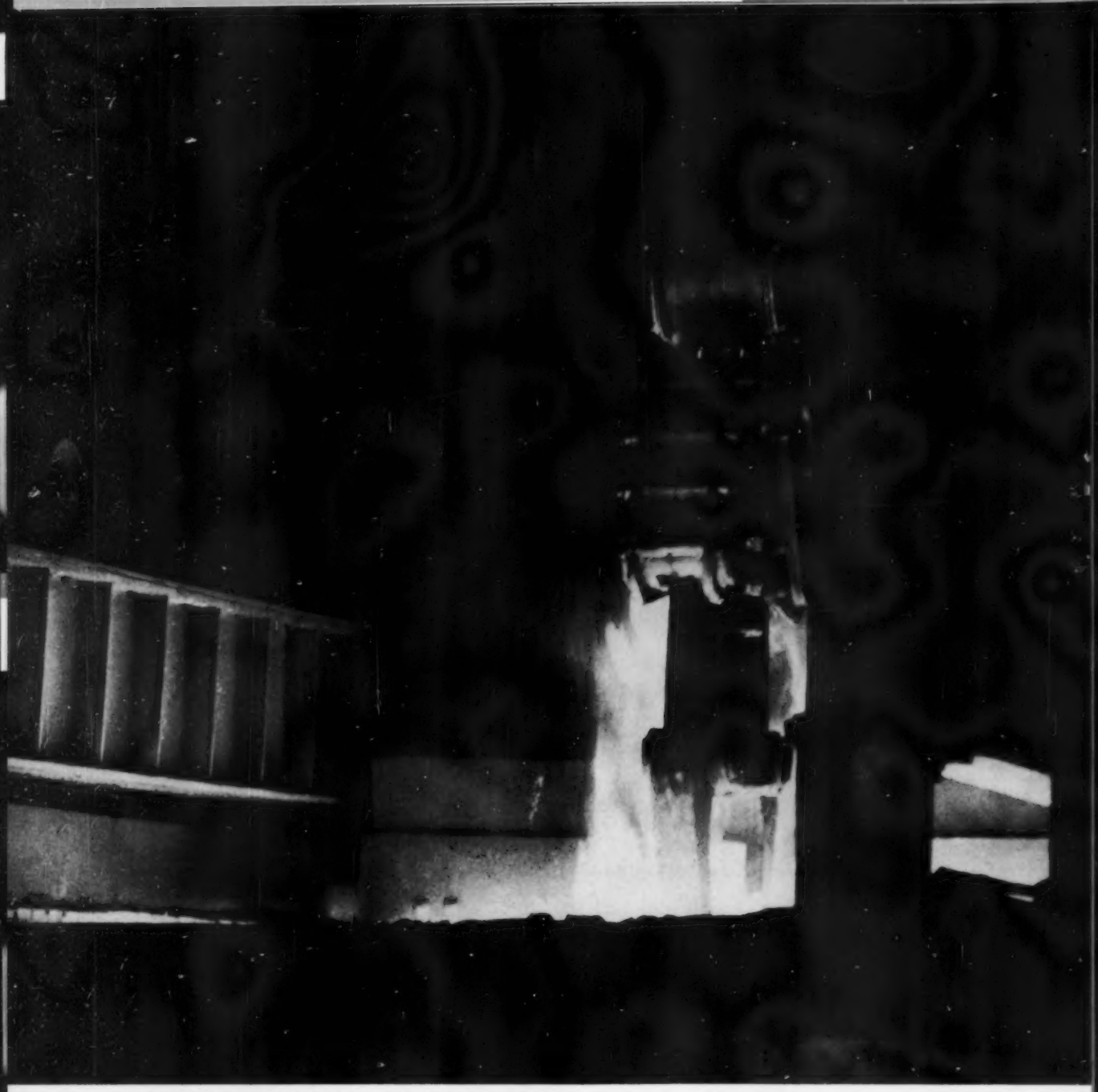
Address_____

City_____ State or Prov._____

For more facts circle 567 on Reply Card

NEW YORK • CHICAGO • FULLERTON, CALIFORNIA

Send for your free copy today.



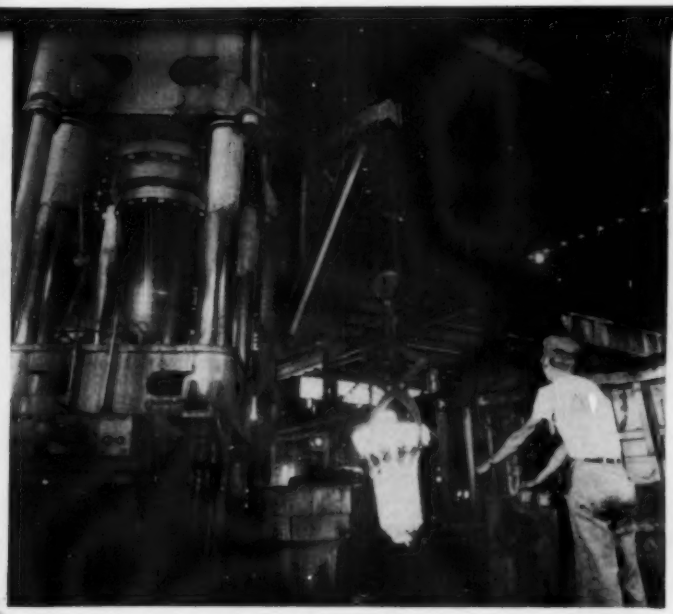
Bearing life increased at least two and one-half times with Gulfcrown Grease E.P. on Green River Steel soaking pit covers.

Gains 36% more production, saves $5,000 a week, by

GULF MAKES THINGS

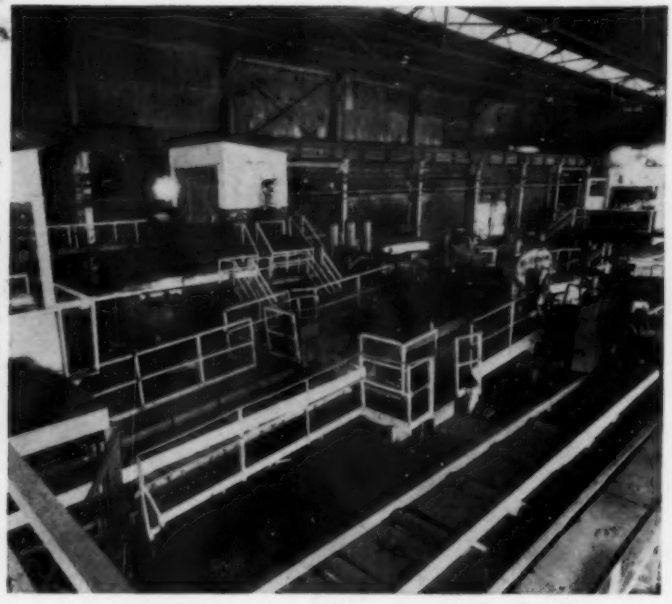
"We've discovered what important savings can be made by simply changing from one grease to another," says Henry J. Werner, Maintenance Superintendent, Green River Steel Corporation, Owensboro, Kentucky. "We were having trouble with the bearings on our soaking pit covers. The grease kept melting out. This meant shutting down the pits, at a downtime cost of $650 an hour. When they're down, we're not pressing steel."

Gulf engineers recommended Gulfcrown Grease E.P., a multi-purpose lithium base grease formulated for unusually heavy bearing loads and high temperatures. "Now," Mr. Werner says, "we have not changed a bearing in the ten weeks the new grease has been in use. We used to replace each bearing every four weeks. Downtime has been cut from 12 hours a week to 4, a weekly savings of $5,000. This has resulted in an increase of our average



Gulf Harmony oil protects against rust and foam in hydraulic systems of Green River's forging presses.

Manipulator, lubricated with Gulfcrown Grease E.P., places billet in forging press.



Longer gear and bearing life on Green River's blooming mill, intermediate and finishing stands is assured by the use of Gulf E.P. lubricants.

Left to right, Marshall Ringo, Gulf Sales Representative, Thomas J. Bartlett, Jr., Gulf Owensboro Distributor, Nelson C. Walker, Executive Assistant to the President, Green River Steel Corp., and George Carney, Gulf District Manager.

switch to Gulfcrown® Grease E.P.

RUN BETTER!

production of 36%, or 702 tons a week."

Based on this experience, Green River plans to standardize on Gulfcrown Grease E.P. for grease applications. To protect against rust and foam in hydraulic systems throughout the mill, Gulf Harmony® oil is used.

Perhaps a Gulf Sales Engineer can help you improve your lubricating practice, and help you make sizeable dollar savings. Just call the nearest Gulf office.

GULF OIL CORPORATION
Department DM, Gulf Building
Pittsburgh 30, Pennsylvania

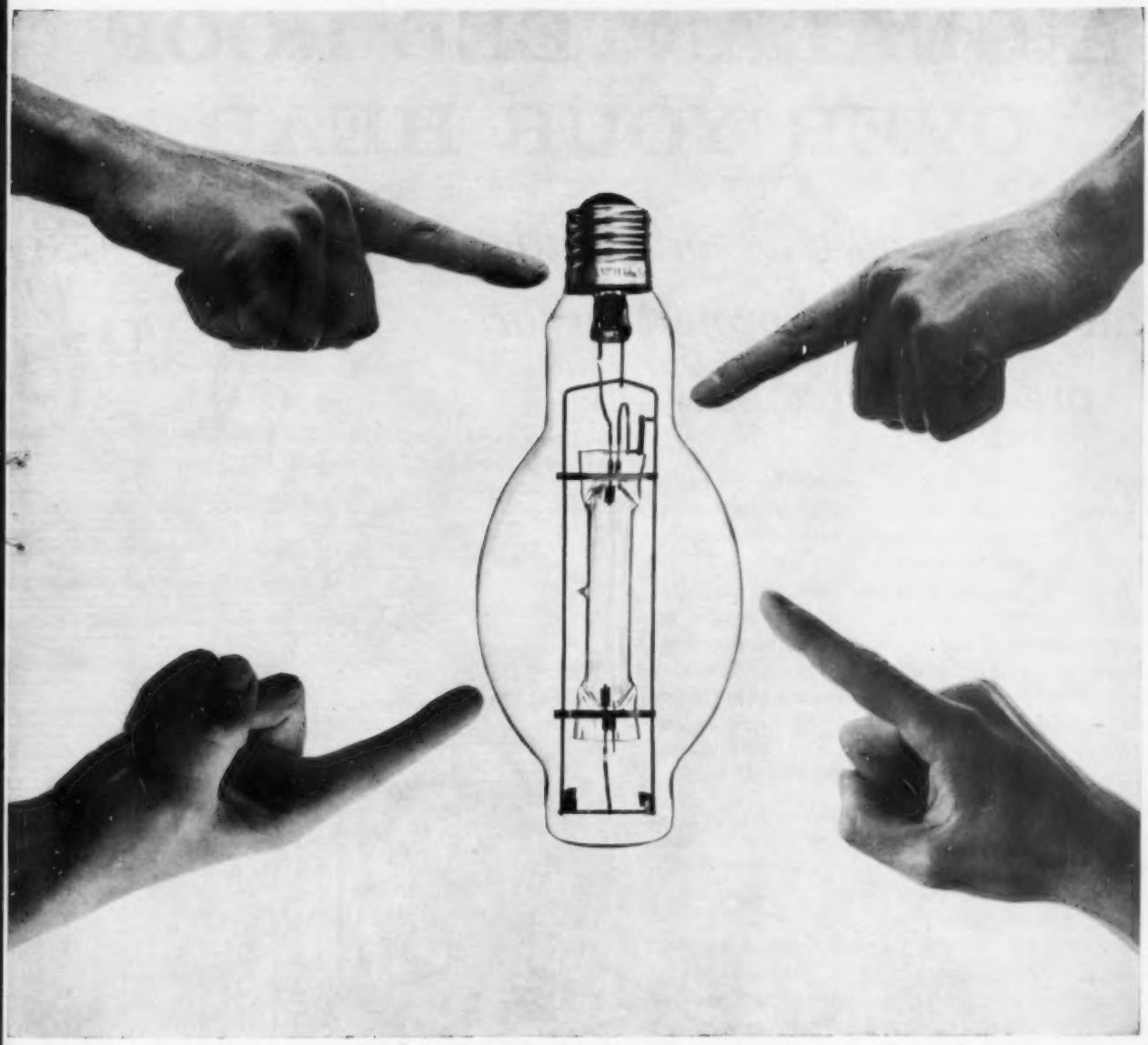
GULF

For more facts circle 568 on Reply Card

Mercury lamps may look alike

These Mercury lamps look alike and cost about the same, but one—the Westinghouse Lamp—will deliver more light initially and maintain this high light output longer. It is your most economical choice for industrial and commercial lighting and incorporates all 4 outstanding improvements listed below.

1. Lifeguard™ arc tube to improve lumen maintenance. Even after 10,000 hours of use, these lamps will still give 85% of their initial light output. *This means that 2½ years after you install Westinghouse Mercury Lamps, your plant or streets will have almost the same high level of light as when the lamps were new!*



. . . but four differences make one a better buy!

2. New design electrodes lock in the emission material and insure long life and easier starting.

3. Weather Duty™ construction. Special glass is resistant to thermal shock and corrosive fumes. Moisture, industrial fumes, even snow and rain can't harm these Westinghouse Mercury Lamps.

4. Hi-temp silicone cement holds bases tight for life . . . actually gets stronger as the lamps burn. No drop-outs. Westinghouse even date-codes its mercury lamps so you can check performance.

No matter what type or wattage of mercury lamps you use, you will get more value and light for your money—plus longer, trouble-free service—by specifying and insisting on Westinghouse Mercury Lamps. Westinghouse makes the most complete line of mercury lamps in the industry . . . 100 to 3000 watt sizes . . . in clear, color-corrected and reflector types. Contact your authorized Westinghouse lamp agent or nearest Westinghouse sales office.

YOU CAN BE SURE...IF IT'S Westinghouse

WESTINGHOUSE LAMP DIVISION, Westinghouse Electric Corporation, Bloomfield, N. J.

A GUARANTEED ROOF OVER YOUR HEAD

New...and only with Butler... full 20-year roof protection for pre-engineered buildings

Here's another reason to "go Butler" for your new building this year. You can have a preferred aluminum roof of such job-tested superiority that we are now able to offer a *20-year guarantee.*

This is the first and only long-term roof guarantee for pre-engineered buildings. It is made possible by Butler's leadership in designing and fabricating an enduring, weatherproof aluminum roof system that today has an impressive history of outstanding performance on thousands of Butler Buildings. Be sure that this new development in roof security, optional at nominal extra cost, is considered in your building plans.

Your Lowest-Cost Way to Build Well—superior roof protection is one of many reasons why more offices, plants, stores, warehouses, terminals, recreation centers, schools and churches every year are being built with the Butler Building System.

For your new building, take advantage of the wide, clear spans of Butler rigid frames . . . the beautiful new Butler-Tone™ baked-on color finishes for wall and roof panels . . . your choice of the finest factory-insulated or field-insulated exterior wall panels . . . the fast, trouble-free construction . . . and the dependable, talented services of your local Butler Builder.

Interested? See the Yellow Pages for the name of your Butler Builder, under "Buildings" or "Steel Buildings." Ask about financing, too . . . or write direct.

See Sweet's Industrial Construction File—Section 8-B

MBMA

BUTLER

BUTLER MANUFACTURING COMPANY
7529 East 13th Street, Kansas City 26, Missouri

Manufacturers of Metal Buildings • Equipment for Farming, Oil Transportation, Outdoor Advertising • Contract Manufacturing

Sales offices in Los Angeles and Richmond, Calif. • Houston, Tex. • Birmingham, Ala. • Kansas City, Mo. Minneapolis, Minn. • Chicago, Ill. • Detroit, Mich. • Cleveland, Ohio • Pittsburgh, Pa. • New York City and Syracuse, N.Y. Boston, Mass. • Washington, D. C. • Burlington, Ontario, Canada

For more facts circle 570 on Reply Card

For more facts circle 570 on Reply Card

MORE OF 'EM...QUICKER!

Another
PLUS VALUE
provided by your
TUBE TURNS
DISTRIBUTOR

Tube Turns' 12,000 stocked items comprise the world's broadest line of welding fittings and flanges. You can buy any of these on *one order*, from *one source* . . . your nearby Tube Turns' Distributor. This *wide selection and prompt delivery* simplify purchasing, assure matching of specs, reduce job delays, cut costs. Outstanding *availability service* is just one of the many PLUS VALUES you get when you specify and buy top-quality TUBE-TURN* products. Others are shown here.

DISTRICT OFFICES: Atlanta • Buffalo • Chicago • Columbus • Dallas • Denver • Detroit • Houston • Kansas City • Los Angeles • Midland • New York • Philadelphia • Pittsburgh • Richmond • San Francisco • Seattle • Tulsa
IN CANADA: Tube Turns of Canada Limited, Ridgetown, Ontario. DISTRICT OFFICES: Edmonton • Montreal • Toronto

DISTRIBUTOR

*"TUBE-TURN", "tt" and "PIPE-MATE" are trademarks of Tube Turns.

TUBE TURNS
DIVISION OF CHEMETRON CORPORATION
Louisville 1, Kentucky
CHEMETRON

MAIL COUPON FOR FREE DATA
on products featured here.

TUBE TURNS
Dept. PE-5, 234 E. Broadway, Louisville 1, Kentucky

Please send me the following bulletins checked:

- ☐ Taper Face Flanges
- ☐ Knock-off Spacer Rings
- ☐ Light Weight Fittings
- ☐ "Pipe-Mate" Fittings
- ☐ Bellows Expansion Joints
- ☐ Scale-free Couplings
- ☐ Pipe Line Specials
- ☐ Wrought Iron Fittings
- ☐ Alloy Fittings
- ☐ Hinged Closures

Company Name _____

Company Address _____

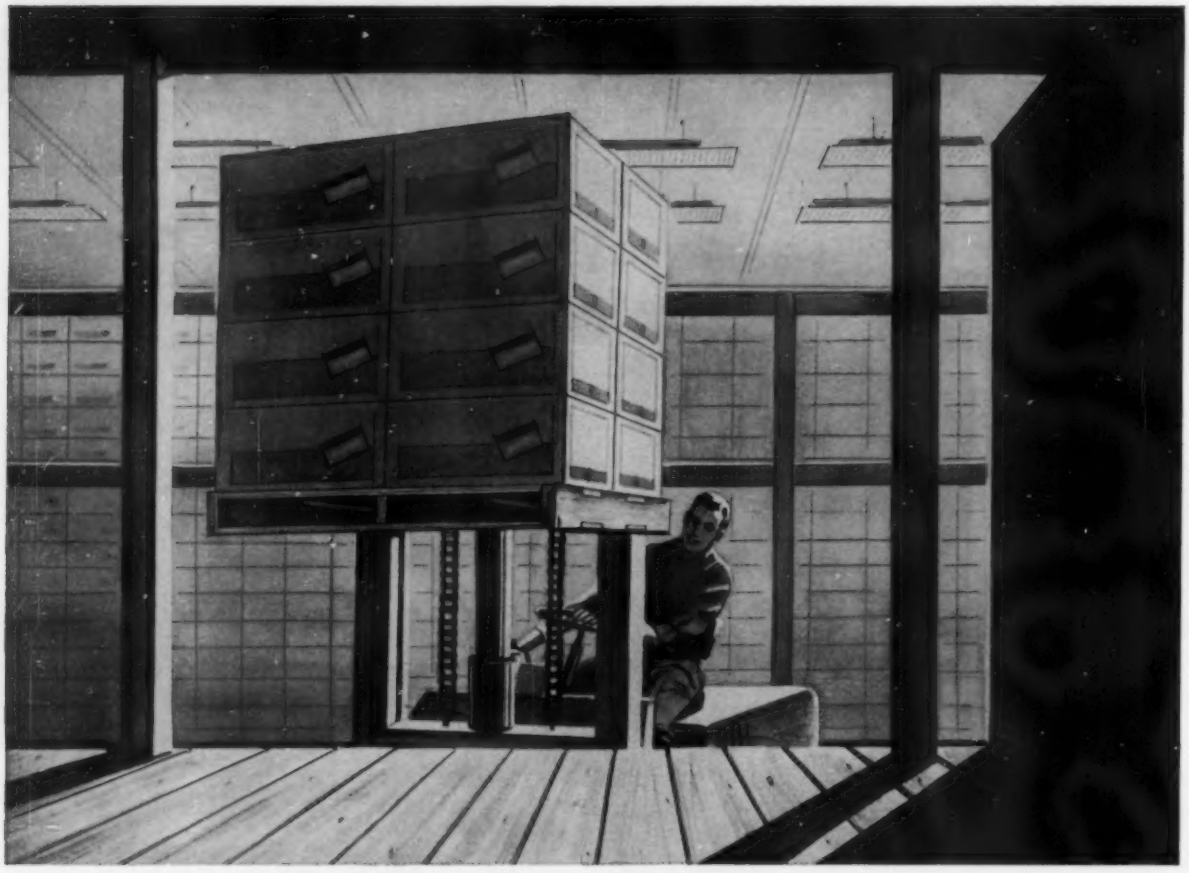
City _____ *Zone* ____ *State* _____

Your Name _____

Position _____

For more facts circle 571 on Reply Card

Eli Lilly and Company finds *electric* trucks help to keep plant clean and quiet



Pharmaceutical maker combines electric trucks and C&D *Slyver-Clad*® batteries for efficient operation

Simple, quick, preventative maintenance program helps Lilly take advantage of the long life built into C & D *Slyver-Clad* batteries.

Eli Lilly and Company, one of the world's leading manufacturers of pharmaceutical products, employs a fleet of electric trucks in manufacturing departments of the Indianapolis plant.

Many of the trucks in the Lilly fleet are powered with C & D *Slyver-Clad* batteries, some of which have been in operation for seven years. Still other C & D batteries have provided dependable performance for as long as ten years, and are still in use!

Long life and dependable performance are regularly experienced by users of C & D *Slyver-Clad* batteries in all types of industry. Why? A few of the reasons are five-fold insulation of plates that virtually eliminates shedding and subsequent life-shortening, sediment build-up. *AccuPak** plates made with *AccuRay*** control are the most uniform battery plates made, which means low cells are eliminated. *Hi-Impac* cell containers and covers greatly reduce breakage of these elements. Trucks rarely have to be taken out of service while a battery gets new covers or containers. These features, plus many more, are why users report a C & D *Slyver-Clad* with *Hi-Impac*, is the *premium battery that makes the difference!* For full details on C & D *Slyver-Clad* batteries, write for Bulletin IT-530.

*Trademark of C & D Batteries Div. The Electric Autolite Co.

**Trademark of Industrial Nucleonics Corp., Columbus, Ohio

C&D C & D BATTERIES of Conshohocken, Pa.... Attica, Ind. DIV. THE ELECTRIC AUTOLITE CO.

Manufacturers of Slyver-Clad® Industrial Batteries • PlastiCell® and PlastiCal® Batteries for Communications, Control, and Auxiliary Power

Producers of AutoReg® Silicon Chargers and AutoCal® Charger-Battery Combinations

For more facts circle 572 on Reply Card

WHAT'S JUST AHEAD IN THIS ISSUE?

- FLOODS, RIOTS, fires or enemy attack can cripple your plant and your community, and even cause extensive damage to the entire country. How is your business protected against such disasters? To help you evaluate how much planning and protection your plant needs or can afford, we recommend the article starting on the next page.

- SULFAMIC ACID is handling the difficult cleaning jobs at Du Pont's Niagara Falls plant. The plant engineering department chose the acid for its excellent cleaning power, and high degree of safety to personnel and equipment. For the "how" and "why" of its use, read the article on page 118, "In-Place Acid Cleaning—Safe and Easy."

- HOW WELL does your work order system function? Are maintenance jobs being lost or delayed unnecessarily because of poor control? If you're having difficulty, read pages 126 and 127 of this issue; the author presents a setup for keeping tabs on jobs, permitting quick visual checks of job progress.

- CHECK ACCIDENTS before they happen! One very good way of doing just that is to carefully review your industrial drawings to be sure all accident potentials have been eliminated. Specific points which should be examined are enumerated in the article starting on page 130.

- WHICH FILTER media is best for your operation? Before you can answer that question you will have to ask yourself several others which are listed in the article beginning on page 148. Once you have the answers to five important considerations, you can select the proper filter medium for a particular operation.

- A STUDY of the factors that affect the efficiency of compressed air systems, and recommendations on design of system controls, piping and work stations make up the article starting on page 152. If you're not getting top efficiency from your air system, this article will help you find out why.

- TWO-WAY INDUSTRIAL radio equipment must be properly maintained for two reasons: primarily to insure continued operation, and because FCC regulations require it. You can't put maintenance off—routine tests and adjustments must be made at stated intervals. Turn to page 156 to learn what the requirements are.

PRE-PLANNING for INDUSTRIAL EMERGENCIES and DISASTERS

By JOHN E. LOCKHART, Manager, Plant Engineering, Evendale Plant, General Electric Co.
JAMES A. DAVIS, Manager, Plant Security, Evendale Plant, General Electric Co.

PLANNING . . . CONDITIONS THE MINDS OF MEN

"The safety of employees, the protection of shareholders' investment, and the continuity of the business require that we search out potential dangers, evaluate the risk involved, and take reasonable precautions to prevent loss and casualties. In this process we may well discover that only a minor extra effort is required to make a major contribution to the safety . . . of our communities in event of a national disaster.

"Emergency planning, while concerned with material resources, concentrates upon conditioning the minds of men—in this instance our managers—to recover quickly from shock and make use of their managerial skills in service to the Company . . . or the nation."

J. B. Montgomery
General Manager
Flight Propulsion Division
General Electric Company

Part I. Determining need for planning . . . What the basic emergencies are and some of the problems involved in each type of emergency

PLANNING FOR emergencies in industrial plants is not new. In fact, some such planning has already taken place in every plant. Even though this planning may have consisted only of installation of fire extinguishers, automatic sprinklers, or fire escapes, it was planning for emergency.

However, the increasing number of large plants, the increased investment in machinery and equipment, the vast interdependence of some plants or businesses on other plants, and to some extent the nation's new vulnerability to enemy attack, have all contributed to the heightened interest in how well a plant is prepared to handle various emergencies which appear to be more or less probable.

In this first installment we shall discuss the general problem of emergency planning. Particular emphasis should be expended in determining why a plan might be desirable; the basic types of emergencies and some specific problems of each; the stages through which emergencies pass; and some considerations involved at each stage.

The second and third articles will discuss planning and organizing and some specific experiences in simulated and actual emergencies.

Admittedly, some plants require very little in the way of emergency planning. A typical small, light manufacturing plant or light assembly plant, using standard, easily replaced tools and equipment, and well located in a small city with good fire protection, may need no formal planning other than the periodic review by fire insurance underwriters. Even a $5000 expenditure on planning may be too much in that plant.

On the other hand, large, complex installations using expensive special equipment, in remote locations, and working with flammable, explosives, or dangerous materials or fuels are forced to do extensive planning. Such planning should ensure that emergencies do not occur or that the employees, the facility, and the business have adequate protection in event prevention is impossible or impractical. Here a $50,000 expenditure for emergency planning to protect a $100,000,000 investment may be much too small.

As could be expected, most plants will fall into probability and risk areas somewhere between these two extremes. The minimum planning for "in-between" plants would seem to consist of a critical review of potential hazards to determine the likelihood of their causing emergency situations, and the related study of the possible effect upon the plant's business. Evaluation of the risk involved is then the basis for a sound management decision as to the extent of a future program, if any. The higher the cost of not planning, versus the cost of planning, the greater the need for a program.

For understandable reasons, many plant managers and plant engineers immediately think of enemy attack when the subject of industrial planning for emergency is brought into the conversation. While this particular reason has a validity and meaning far beyond that of a few years ago, and is not receiving the attention the future might easily prove it well deserves, it is actually the last and might well be the least of the reasons for a good emergency plan in many plants. Basically, emergencies, for our purpose, might be classified as:

1. In-plant, such as fire, explosion, collapse, etc. For an in-plant emergency, plant management normally has, in addition to its own resources, the entire resources of the surrounding community to call upon for recovery. Further, all decisions are in the hands of the plant's owners, managers and insurers.

2. Local, such as flood, hurricane, tornado, earthquake, etc., in which large areas are involved and a particular plant may or may not be involved. The local emergency is characterized by two important differences from the in-plant emergency:
   a. Outside sources of fire protection, labor, material or skill may not be available due to either disability or their concern with other prior, more serious, or more necessary (in someone's opinion, good or bad) emergencies.
   b. The possible moral requirement that the plant make available for the welfare of the community, its entire plant and/or substantial portions of the resources being depended upon for its own protection or restoration.
   c. The concern of employees for their families.

3. National, which would result from massive enemy attack in several communities. The particular plant may or may not be involved. The problems confronting the plant management are the same as in a local emergency, with the addition of:
   a. Needs of the national defense effort, which may not be immediately determinable.
   b. Radiation hazards.
   c. Inability, perhaps, to draw from remote resources.

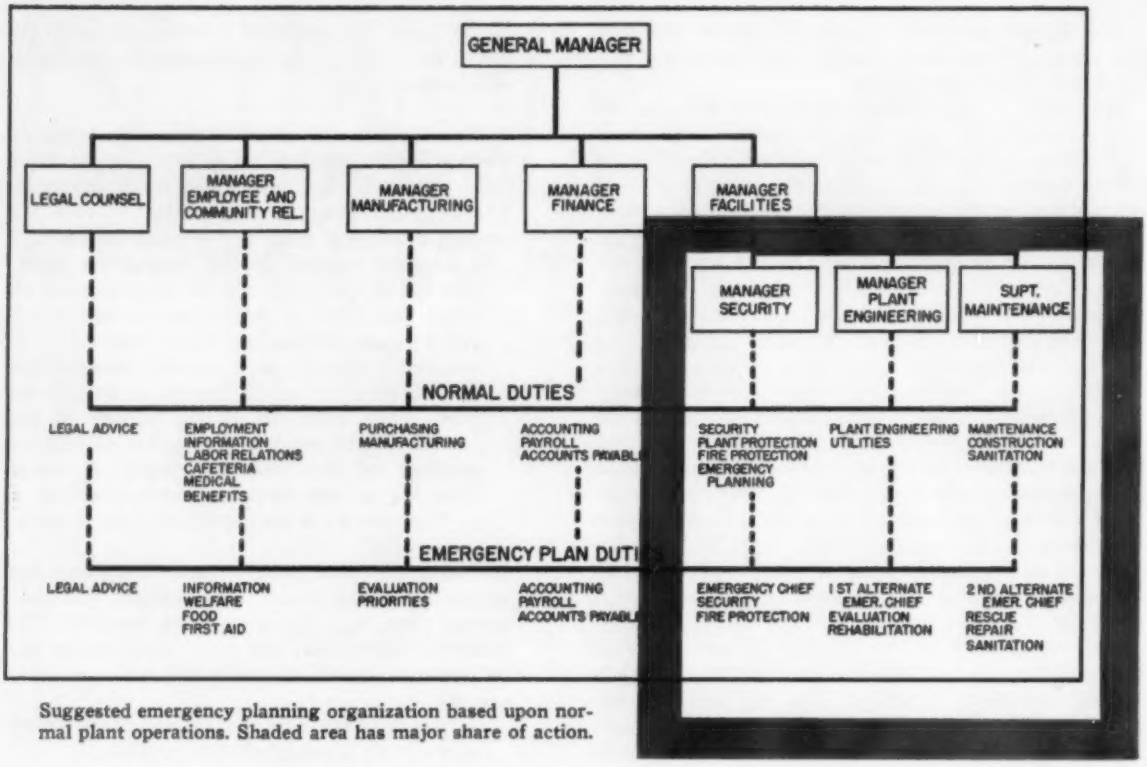
To most of us, the idea of our nation being attacked directly is so repulsive that we consciously and subconsciously refuse to admit that the need for preparation may exist. Plant management should therefore be careful that optimism, or excessive pessimism, concerning a national emergency does not unwittingly become an excuse for having no program at all.

Almost every day some plant in the country is faced with a serious emergency which threatens the very existence of the business. These may affect the large or the small. One recent spectacular fire loss might have been prevented if any one of several preventive or control measures had been taken. A conscientious review of hazards would have exposed the immediate danger; it would also have revealed that an outside

About the Authors

John E. Lockhart, born and raised in central Indiana, the son of a plant engineer, knocked about the country working as a boilermaker, power lineman, machine operator and flag-pole painter. He worked as advertising manager and then as chief test engineer for Reeves Pulley Company, before moving to General Electric's huge Evendale plant just outside Cincinnati. Here he has been Manager, Plant Engineering for the past four years. He is active in the American Institute of Plant Engineers, both locally and nationally, and one of his principal interests is the acceptance of a more precise definition of plant engineering functions.

James A. Davis was born in New York City and educated in schools in and around that city, graduating from Columbia University with an A.B. in Business Administration. He has worked in the accounting field, sales, and credit for such firms as American Ice Company, American Locomotive Co., Chevrolet Division, General Motors. He also worked for eleven years for the Federal Bureau of Investigation. For the past six years he has held his present position as Manager, Plant Security of GE's Evendale Plant where he is responsible for classified security, clearances and investigations, visitor relations, and other phases of plant protection.



Suggested emergency planning organization based upon normal plant operations. Shaded area has major share of action.

INDUSTRIAL EMERGENCIES

resource was not fully reliable; and an annual discussion of responsibilities and dangers might have resulted in faster and more complete action.

Several recent flood losses could have been prevented or drastically reduced had anyone reviewed critically the growth of the communities, the increased rate of runoff due to this buildup and the lessening amount of rainfall required to produce minor floods. A program of emergency planning should not be expected to achieve perfect safety. There will always exist the possibility that a meteor the size of Kansas City is this moment aimed directly at your plant at 15,000 miles per hour or more and only 200 miles away. This risk you may as well take because prevention is unrealistic. A good emergency plan is intended to:

1. Anticipate and prevent all reasonably probable hazardous situations.
2. Be aware of and quickly bring to bear every reasonably available resource to control the damage in event an unpredictable or unpreventable situation occurs.

Enlightened plant management realizes that while some risks must be taken, there are other risks to which the business should not be exposed; they will also quickly realize that, although we may not be able to foresee every potential hazard, this is not a good excuse for not looking.

The first requisite of a good emergency plan is a management whose curiosity is sufficiently aroused about whether or not it is facing some unnecessary risk. Once this curiosity is aroused, a preliminary review of the potential hazards will almost certainly be undertaken. This review would usually determine that the plant is in a reasonably safe condition, that there are certain minor hazards which can be quickly and inexpensively corrected. It might also reveal that there are certain other hazards which will require considerable study to determine the real risk and the cost of correction. There might even be hazards which it is unreasonable to guard against.

Greatest Hazard: Failure to Recognize Hazards

It is also probable that the greatest hazard, and one of the easiest to correct, is a failure to realize some of the hazards to which the plant is exposed. An allied hazard is the lack of systematic periodic review to determine progress in correcting those known problems and to discover any which may have arisen or increased since the last review. In short, the greatest hazard will usually be the lack of awareness of problems and of plans for prevention and control.

Having made a preliminary review, the next step is a decision to develop a plan or not to develop a plan. Assuming a decision to develop a plan, the responsibility must be defined as to who is to do what and when. Usually the emergency plan will become a responsibility of the manager of the plant engineering function, although the size of the plant and the importance of the plan may require the establishment of a separate responsibility in some organizations.

Justification for a plan is that the expenditure in

time and money appears to be necessary to reasonably ensure the continued profitable operation of the business and the health and safety of employees.

Once there has been a decision to study a planning program, the question arises as to how to approach the problem, or for what should we plan? Basically, one should plan to 1. prevent as many emergencies as reasonably possible; 2. immediately bring all available resources to bear on any emergency in order to quickly reduce the emergency and control damage; 3. assess the damage and make temporary restoration; 4. make permanent restoration.

Inspection and Recommendation

Any sound emergency plan embodies thorough and effective planning to prevent emergencies to the maximum economical degree. In addition, the plan should minimize damage from those foreseeable emergency situations which have been found to be economically nonpreventable.

Regular inspection to ensure compliance with codes and underwriters' recommendations is a logical first step. These recommendations will substantially cover construction of buildings; installation of manufacturing equipment; sufficiency of accessways; protective devices and warning devices; dispersal and isolation procedures; reliability of control equipment; and, in some instances, pointing out a need for additional outside reserves or support.

On the other hand, hazards from acid-handling, in-plant traffic congestion, power failure, flooding of pits, and any of many hazards peculiar to particular businesses, facilities, or locations may not be discovered except by critical review of the particular plant.

Prevention and minimization planning could be extended to cover organization of personnel for both prevention and control, training in prevention and quick control, and the establishment of certain procedures for inspection, shutdown, notification, isolation, evacuation, abandonment, etc. In some instances exercises and practice evacuations may be indicated. Although planning should be primarily aimed at plant-contained and localized emergencies, participation in local Civil Defense planning may have value as a constant reminder of the necessity for review, and for the information and experience obtained.

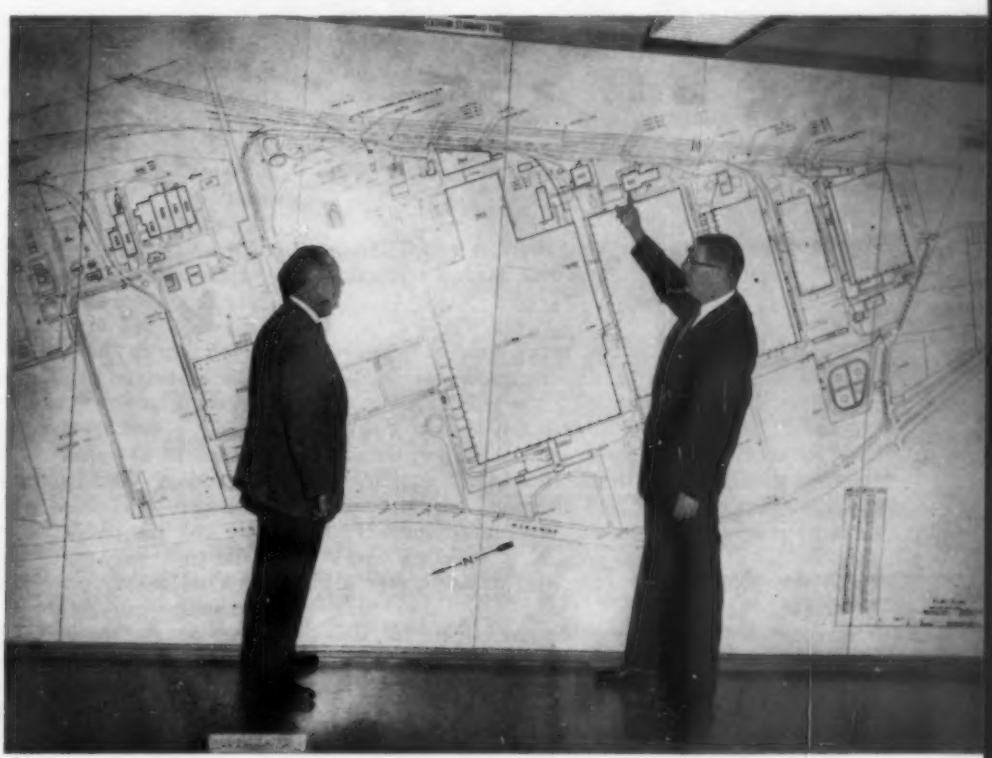
The second phase of the emergency plan is the planning for controlling an actual emergency situation. The key element here is the bringing to bear, with the required speed, all the forces, equipment, and skill necessary to promptly bring the emergency situation under control, and preventing secondary emergency situations.

Some of the most important considerations are:

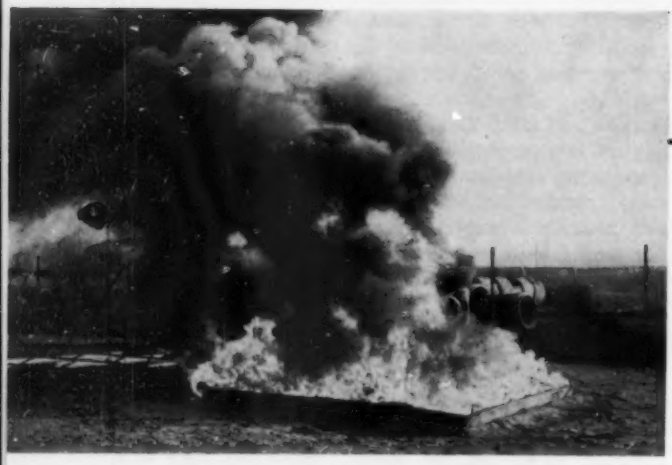
1. The alarm system should notify all who may be required. Delay in shutting off gas or electricity, due to failure to notify a plumber or electrician, may result in extended damage. The alarm need not require action on the part of all, but should provide a warning for all to be available and alert.

2. Some one person should be responsible for assuming complete charge.

3. Sufficient strength should be brought to bear



Authors Davis and Lockhart discuss a problem before large plan of the plant in Emergency Headquarters. The two men share most of the responsibility of planning any emergencies.



Volunteers are trained in extinguishment of large fires, using heavy equipment. This tank holds 300 gal.

INDUSTRIAL EMERGENCIES

as rapidly as possible; overconfidence and/or a poor early estimate of the situation have been the real cause of many serious losses.

4. Intensive, intelligent, and repeated training and practice are of the utmost importance.

5. In localized or national emergencies:
   a. Some defections of personnel may occur; this appears to be less of a problem with the more highly trained personnel.
   b. Community fire departments, water, or electric power may not be available. It is under these circumstances that the real dividends may be obtained from a good emergency plan. The promptness of decisions based upon experience from exercises; the extra reserve equipment, which was obtained at little or no cost, or the quick resort to abandonment, isolation, or destruction, may mean the difference between a little damage and no business or property remaining at all.

6. Making sure the emergency is ended. Some serious mistakes have been made by relaxing vigilance too early.

The third phase of the emergency plan is the assessment of damage and the commencement of restoration. The reasons for extending the plan to the post-emergency period are not immediately apparent. However, the speed, completeness, and accuracy with which the total damage to the facility, production equipment, raw, in-process, and finished inventory, and to books, records, plans, and designs is determined may affect the company's ability to return to competition. It could also influence the decision as to whether or not to rebuild.

Amount and depth of thought given in the planning prior to the emergency can drastically cut the amount of time required to return to business as usual, or perhaps to an even more competitive position with new production equipment and facilities.

Planning for the post-emergency period should be carried out by, or at least be reviewed by, the upper levels of management. A pre-emergency study of the desirability of rebuilding, expanding, improving, or even abandoning the existing plant may well result in better post-emergency decisions more quickly made. Financing of the various restoration possibilities, and the company's resulting market position may be good subjects for pre-emergency discussion, if not actual planning.

Most companies can proceed with post-emergency plans without restriction, especially in event of plant-contained emergencies. However, in localized or national emergencies, restoration—especially temporary restoration—may be seriously limited. Such limitations may be imposed by the need to provide emergency shelter, sanitary facilities, kitchens, and medical facilities for the surrounding community. In localized emergencies the moral obligation to the community will prevail upon most managements; in national emergencies the conscriptive power of Civil Defense may be exercised.

In event of national emergency by reason of massive enemy attack, the restoration of plants engaged in defense business, as well as other key plants, certainly will be governed by requirements of the armed services. In such plants the decision to restore, in order to supply the same or some new service or product, or to abandon, or to cannibalize for the benefit of some other plant or service, may require extensive study of the entire national situation.

For example, restoration of a plant to produce aircraft engines designed for an aircraft which was produced in a plant no longer existing, would be a complete and utter waste of critical resources.

A sound emergency plan for an industrial plant should:

Be suited to the particular needs of the plant.

Be realistic with respect to the risks involved and the expenditures required for reduction.

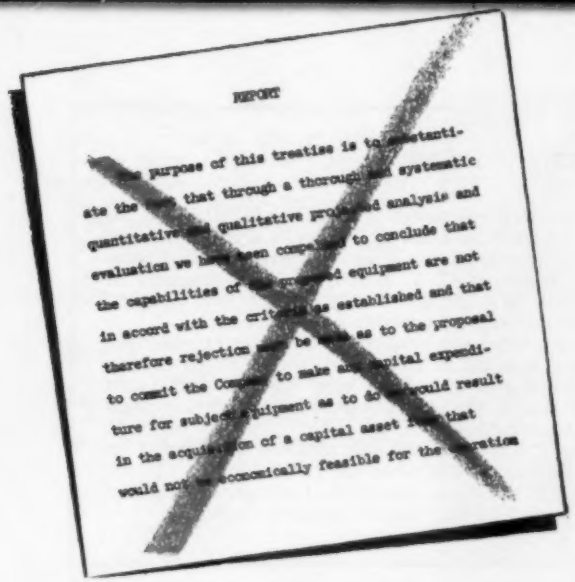
Take into account possible complications and increased risks due to concurrent emergency situations inside or outside the plant.

Take advantage of all resources.

Include prevention and minimization in the pre-emergency period, the most effective possible utilization of control of the emergency situation, and the basic considerations of the immediate post-emergency period.

Anticipate integration with the needs of the community and the nation in event of local disaster or national emergency.

Forward-looking plant management will recognize that planning cannot assure absolute immunity from risk, but that full responsibility to owners, shareowners, customers, and employees has not been carried out until a realistic look has been taken at all foreseeable hazards and reasonable steps have been taken to protect the business. **End, Part I**



Effective Communications—

Saying it simply gets it done fast

By **BURKE W. WOMBACHER,**
Plant Engineering Consultant
Redondo Beach, Calif.

"WE TOOK A CLOSE LOOK at the proposal to buy X machine and have determined that it won't do the job."

This is a clear, simple and brief "translation" of the report you see illustrated above.

Plant engineers, scientists and others of us who live in a world of technical jargon usually communicate within our groups in technical language, and this is as it should be. However, when these people express themselves outside their respective groups, they should strive to apply the principles of effective idea communication: clarity, simplicity and brevity.

Language is the basic common denominator of communications and the artful person makes use of common language as a tool. He will win the consideration, respect and confidence of others. Those who confuse with wordiness are likely to be suspected or distrusted.

There is clearly a need for using common language but unfortunately many people attempt to communicate in just the opposite fashion. Let's examine some of the reasons for wordiness:

1. By reason that the subject is highly technical, it demands that technical jargon be used.

2. Covering up a lack of knowledge by copying from a handbook.

3. Deliberately trying to confuse.

4. Routinely trying to impress others through a demonstration of "dictionary knowledge."

5. Trying to describe with words what could be more simply explained with a drawing.

Plant engineers especially have the need to be able to communicate their ideas effectively. Their wide range of activity requires them to have a high degree of technical knowledge in almost every field of engineering and plant operations. They must communicate to people at all levels, from the janitors to the president. It is noticeable that the most successful plant engineers are those who have the ability to express themselves clearly, simply and briefly.

Nowadays we notice that the ranks of top management include an increasing number of people with little or no shop experience or engineering technical training. They are instead men of business background and are the ones who most depend on the plant engineer to keep them advised and informed. They need trusted and respected people to make many of their decisions for them.

Outline to Follow

When writing reports or when making a verbal presentation, it is my general practice to follow this outline:

1. Subject. A clear statement of the problem or question.

2. Answer. A simple understandable solution or answer. Simple sketches or photos are worth hundreds of words.

3. Reason. A brief statement of the outstanding reason will usually suffice.

4. Supporting data. In general, I believe that the routine inclusion of supporting data tends to degrade a report.

If a plant engineer routinely supports his reports with data, it can be an indication that he does not have the proper respect from management, or for some other reason he feels compelled to prove his answers. Furnishing voluminous data can create a doubt in the mind of the listener.

On the other hand, there can be strong reasons for furnishing supporting data; it may have been stipulated in the first place, or by its nature the report or presentation is not clear without it. Also a call for data can indicate that your idea has taken hold and has created real interest; remember that a major decision on a new idea may require careful scrutiny.

5. Questions and answers. I consider that a question and answer period adds the most to a verbal presentation. Customarily I like to apply the principles of clarity, simplicity and brevity to communicate the general idea, making free use of simple pictures and charts, then follow with a question and answer period.

Watch out that you don't skimp on words in an over zealous effort to be brief, and also be careful that you do not presuppose knowledge on the part of the listener.

A simple way to measure yourself and others for excess wordiness is by watching for the telltale signs. If the average report is so written that it must be read more than once and interpreted, then it is not an example of effective idea communication. **End**

By CLYDE T. GALLINGER
Senior Engineer
Niagara Falls Plant
Electrochemicals Dept.
E. I. du Pont de Nemours and Co.

IT'S QUICK, EFFECTIVE, CHEAP

CLEANING AND descaling equipment with acid has taken on an informal note at the Niagara Falls plant of Du Pont's Electrochemicals Department. Part of this new approach to an ever-present maintenance problem is due to the efforts of C. T. Gallinger, Senior Engineer at Niagara Falls. The rest of the credit goes to dry sulfamic acid cleaners, which are used even though HCl is available as a by-product.

Cleaning projects that were once considered tasks for maintenance specialists are now being handled as a matter of course by production personnel. One large still is now cleaned by plant labor at a total cost of approximately $200, and at the plant's convenience. Contract cleaning price had previously been $1,300.

Jobs requiring 20 to 2,000 lb of sulfamic cleaners are carried on every day as a matter of routine. The plant will use more than 125,000 lb of sulfamic cleaner this year. According to Mr. Gallinger, each pound represents a savings of about $1 over cost of previous cleaners.

IN-PLACE ACID CLEANING— SAFE AND EASY

WE HAVE BEEN cleaning equipment with inhibited sulfamic acid formulations for several years, with a great deal of success and noticeable drop in maintenance costs.

The things we like most about these cleaners—besides the effectiveness—are the safety they offer for both personnel and equipment, and the ease with which they can be handled. Sulfamic's effect on skin is negligible. For safety's sake, however, we do require that goggles and gloves be worn.

There is never any possibility of damaging equipment by adding too much acid. We normally clean with a 5 to 10 per cent solution, but even a saturated solution of 30 per cent would do nothing more than remove scale at an increased rate—although less economically. If additional acid were added to an already saturated solution, the excess would simply remain in solid form, gradually going into solution as strength was used up in removing scale. This makes it ideal for use by semi-skilled labor.

Before adopting sulfamic cleaners, it was common practice to remove tube bundles from equipment and send them to a maintenance shop for submerging in a tank of hydrochloric acid. Tubes were often hand cleaned with air tools since it was not possible to get good circulation through them in the tank. On some occasions, fixed tube exchangers had to be cut apart to remove rust, scale, and dirt from the shell side. This was costly, especially during high production periods.

In-place cleaning was long ago recognized as the best method of descaling, and we first tried it with inhibited hydrochloric acid. Leaks and spillage caused unnecessary damage and lost time. Improper use of inhibitors corroded pipelines and damaged equipment. Fumes were objectionable and harmful to personnel and equipment. Transporting carboys proved hazardous for work on upper floors or in awkward location. Pipe connections often leaked under pumping pressure.

With sulfamic cleaners, a minimum quantity of high strength solution readily removes the scale to bare metal. Cleaning is fast, with no fuming. No localized etching or corrosion has been observed as was the case with hydrochloric.

Sulfamic based cleaners have proven more economical for us than hydrochloric even though our plant produces its own supply of the latter. One man can now do the job that previously required two or more.

Available in crystals or granules and packaged in disposable fiber drums, the cleaners can be carried to remote places in bulk and mixed with water at the job site to provide the acid solution required.

Experience has allowed us to establish some simple cleaning procedures based primarily on the type of scale to be removed and the design of the equipment being cleaned.

As with all chemical cleaning, temperature, solution strength, and circulation rate help to determine the effectiveness of our operations.

Solution temperatures are kept high whenever possible, but are seldom allowed to go much above 160 F.

Although solution strength is not critical, it is normally kept between 5 and 10 per cent. A rule of thumb measurement is 40 lb of dry acid for each 50 gal of water. Even at much higher strength, sulfamic is still safe to handle and use, and does not give off fumes. For this reason it is often more practical to simply add acid if solution strength is suspected of being low.

No damage will result, and the job will be done much more quickly than if time were taken to make an

Sulfamic cleaner is dumped into the makeup drum and then mixed with water to form the acid solution. Solution strength is usually between 5 and 10 per cent. Rule of thumb measurement: 40 lb cleaner for 50 gal water.

Far right: Acid returning from the equipment foams and bubbles as carbon dioxide is released by dissolving scale. Lack of such action is one indication that most of scale has been removed.

accurate check. A quick field test can be conducted by simply throwing a pinch of soda ash into the acid. If the reaction is violent, solution strength is probably high enough. However, if reaction is slow, more acid should be added.

A high circulation rate is usually desirable, particularly when equipment is badly clogged. This keeps fresh, strong acid against the scale at all times.

Pumping and Circulating

We have three separate pumping and circulating methods, depending upon the individual job.

Steam jet ejectors are widely used since they provide heat as well as circulation, are simple to use, and are inexpensive. They will develop vapor locks when the solution temperature goes above 160 F. Since this is the maximum recommended cleaning temperature, no problems are involved. In actual operation, the steam ejector is turned off when solution temperatures reach 160 F, and the acid is allowed to stand in the equipment until it cools. The ejector is then turned on, and circulation is resumed.

For convenience, process pumps are used whenever possible. In some instances, they provide circulation after steam ejectors are used to heat the acid solution and fill the equipment.

For high pressure pumping and high circulation rates, a portable, high output pump is used. It is particularly helpful on large equipment, or on smaller equipment with badly clogged tubes. Heat is supplied by a steam hose.

AUTHOR-ON-SPOT

Author Clyde Gallinger demonstrates one phase of acid cleaning technique

Cleaning Procedure

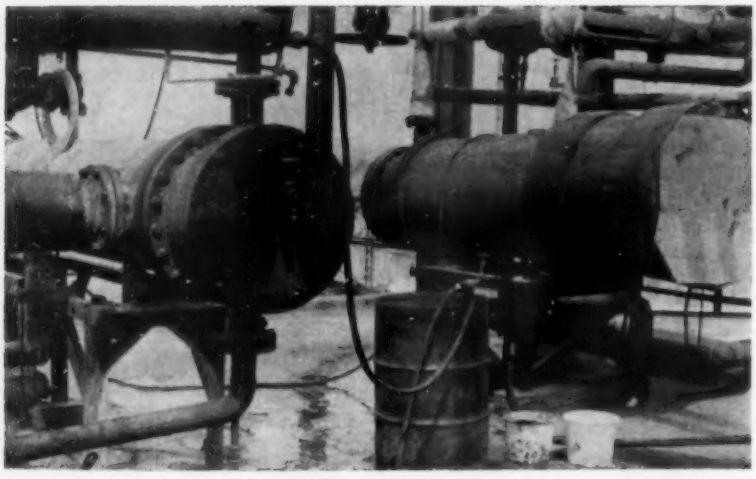
For most cleaning jobs, we use a 55-gal steel drum as our acid reservoir, a steam jet ejector for heating and pumping, and some hose. Although some drums have been used dozens of times, none show any evidence of acid attack.

The following steps would be taken to complete a typical cleaning job on a condenser or similar piece of equipment:

1. Dump 40 lb of inhibited sulfamic cleaner into the drum.
2. Add water and dissolve the acid by stirring when necessary.
3. Extend the suction side of the steam jet ejector with a pipe long enough to reach the bottom of the drum—slightly shorter if much sediment is expected, to keep from pumping sludge.
4. Connect the ejector to a reinforced steam hose with a valve on the pressure side.
5. Connect the ejector discharge to the equipment's water inlet with a reinforced water hose or pipe and valve.
6. Finally, run a return line between equipment's water outlet and makeup drum. The line should be at least as big as the acid input line. To avoid any pressure buildup, it

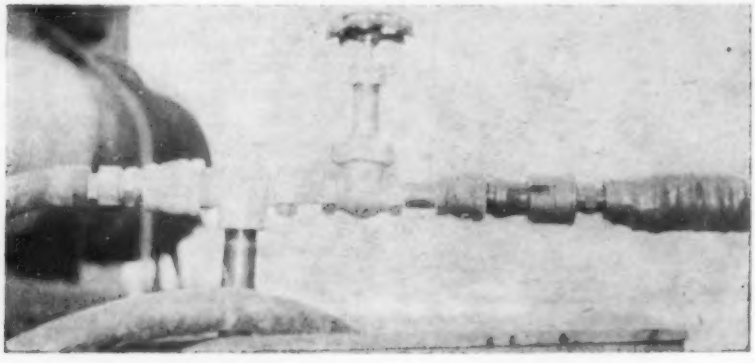
IN-PLACE ACID CLEANING—SAFE AND EASY

Equipment shown here is all that is needed for cleaning most pieces of industrial equipment. A steam jet ejector with suction extension is used for heating and pumping acid. A valve, some hose and buckets for cleaner are other items.



Heat exchanger at left is ready for cleaning. All drains except the water outlets have been valved off and the head has been replaced (replacing every second or third bolt will usually suffice). A steam hose is connected to the ejector. Another hose from the ejector to the equipment's water inlet will introduce the acid solution which will then return to makeup drum through outlet hose, at upper center.

On most cleaning jobs, pumping is done with steam jet ejector that heats the acid.



should be completely open at all times.

7. Drain the equipment, and valve or blank off all external feed lines and drains.

8. Turn the steam ejector on. Pumping will begin. Forty to 125 psi of dry steam pressure should be used. Wet steam will not operate the ejector.

9. When solution temperature reaches approximately 160 F, the ejector should be turned off, holding the acid in the equipment until the temperature drops 20 to 30 deg.

10. If the acid becomes extremely dirty, it should be disposed of and a new batch prepared.

11. Continue until the equipment is cleaned.

When the equipment is filled, acid will flow back into the drum through the return line. As scale is removed, carbon dioxide will also be released through the return line, causing bubbling and foaming. As long as this continues, the equipment is not clean. Acid strength should be checked continuously, and fresh acid should be added to keep the solution strength between 5 and 10 per cent.

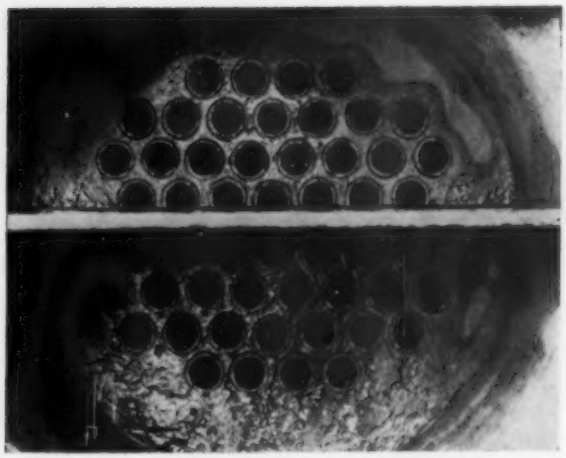
In filling equipment holding more than 50 gal, it will be necessary to mix additional batches of acid. This can easily be done with one drum by adding more acid and water as the solution level nears the bottom. However, some people find it more convenient to use two drums for this purpose. While pumping takes place from one drum, an additional batch of acid is prepared in the other. When the first drum is emptied, the ejector is placed in the second drum and the process is reversed. For jobs requiring large quantities of acid, we use any available tank, or a Dempster Dumpster sludge tank.

After cleaning is complete, the system should be flushed with water. If it is to be left unused for any length of time, a two to five per cent rinse solution of soda ash should be used to retard rusting.

Cleaner Variations

In addition to regular sulfamic cleaners, we also use two variations. One is a mixture of sulfamic cleaners with ordinary salt. The second is a mixture of sulfamic and oxalic acid.

After being drained, head of this heat exchanger was removed for inspection. Tubes were plugged with scale, rust.



Close-up showing results of cleaning. Because iron oxide was part of scale makeup, salt was added to sulfamic acid.

Inhibited sulfamic cleaners are very effective by themselves for removing common water scale, but are not too effective against iron oxide. The sulfamic and salt mixture (in a two to one ratio) is excellent for removing rust.

The sulfamic and oxalic mixture is used when a combination of water scale, iron oxide, and some organics must be removed from stainless steel. To keep insoluble oxalates from forming, the initial treatment is with sulfamic alone. This solution is then disposed of, and the mixture of sulfamic and oxalic (in a two to one ratio) is introduced and circulated.

Floor-Wide Cleaning

Our most unusual use of sulfamic based cleaners resulted during an emergency situation last winter. Calcium waste from an up-river plant entered the water intake in large quantities. The deposit solidified at 46 F. Although it was noticed almost immediately, all pipelines in several buildings were heavily coated, and smaller ones were plugged almost solid.

The buildings were shut down, and an attempt was made to descale the lines. At the same time, we decided to try cleaning the water side of all equipment inside each building on a floor-wide basis — simultaneously.

Although suitable pumping facilities for such a major undertaking were not available, it was decided to see how much headway could be made against the scale during the three days allowed for shutdown.

The acid solution was mixed in a 7,000-gal tank obtained from salvage. The tank was connected to the building's water main. Return lines were blanked at the sewer and temporarily piped back into the tank. Six 1½-in Penberthy steam jet ejectors were installed between the tank and the water main to heat and pump the acid.

Our plan of action was relatively simple. After closing off all valves on the lower floors, we would pump acid up the main to the fifth floor level, filling all equipment. We would then stop pumping and check acid strength, replenishing if needed. When solution strength diminished, we would drain all equipment and start over until we judged the units to be reasonably clean. The same plan would then be carried out on each of the lower floors.

Unfortunately, valves on the lower levels were scaled open. To close them, it was first necessary to pump acid through the lines and dissolve the scale. Cleaning on the fifth floor was then started.

We were seriously hindered by cold weather, and could not hold acid in the equipment for fear of damage from freezing. Even after piping a 110 gpm process pump into the system, circulation was not fast enough to clean all equipment properly. Lines, however, were completely free of scale and rust as were small tube bundle heat exchangers with water on the tube side. Large tube bundles with water on the shell side were greatly improved but not completely clean.

This verified our original surmise that all equipment could not be thoroughly cleaned in such a limited time with the equipment available. Even so, we continued cleaning both buildings on a floor-wide basis. Results in general were very favorable. **End**

(Please turn page for data on Special Cleaning Techniques)

Want a 1-lb Sample Free?

Cleaning his wife's steam iron (and probably the teakettle, too) was the first test to which Clyde Gallinger put sulfamic acid. You, too, can try the acid, either at home or in your plant. Du Pont has agreed to supply 1-lb boxed samples of sulfamic acid, complete with instructions, to those readers of PLANT ENGINEERING who request them **on their company's letterhead.** Send your requests to The Editor, PLANT ENGINEERING, 308 East James St., Barrington, Ill.

IN-PLACE ACID CLEANING—SAFE AND EASY

SPECIAL TECHNIQUES FOR CERTAIN EQUIPMENT AND CONDITIONS

STILLS

STILLS ARE cleaned by filling the base with enough acid to pump from there to a feed point. Heated acid is then circulated. With sieve plate or bubble cap stills, the acid percolates over the still surfaces and removes the scale. A smaller quantity of strong acid can thus get quicker results than a flooded wash of a lower strength solution.

Thorough flushing is important. A simple water boil-up with rapid drain is sometimes sufficient. When solids are loose on the plates, it is necessary to boil up and then add air or inert gas at the base to keep the solids in suspension so they will be carried off while draining. The air or gas is added constantly during draining. Flushing should be continued until visual inspection shows the equipment to be clean.

Where water scale is accompanied by other types of scale and deposit, we first clean with sulfamic alone to remove carbonates and other solubles and then flush. Iron rust in steel body stills with stainless steel plates is then removed by the sulfamic-oxalic method. Sulfamic composes from five to 10 per cent of the solution.

When calandrias are a part of the still, good circulation is necessary during both the cleaning and flushing cycle. In some cases only the calandria needs to be cleaned.

HORIZONTAL CONDENSERS

HORIZONTAL condensers with water on the tube side are cleaned by rapidly circulating heated acid from bottom to top. Solution strength should be checked at least once every hour since it often drops rapidly at the start. We have seen 15 per cent acid drop to two per cent in less than one hour on badly scaled equipment.

Horizontal condensers with water on the shell side can be difficult to clean if mud forms a part of the scale. For convenience, we have installed permanent air taps along the bottom of these condenser shells to permit periodic air agitation. This suspends the mud and allows acid to attack the scale. Air should not be introduced continuously since the shell will fill with air, restricting acid flow. The air taps are also used during flushing so that all acid and mud is suspended in the water and removed.

VERTICAL CONDENSERS

SULFAMIC cleaners have handled many tough jobs for us. Two vertical condensers with water on the shell side were almost totally plugged with mud and scale when the bundles were removed for re-tubing, a time-consuming job involving high labor costs. The companion pair of bundles was cleaned in place with sulfamic acid using a 320 gpm pump.

Close control of acid strength, 160 F solution temperature, and good circulation were maintained. Acid consumption indicated the removal of 1,200 lb of scale. Mud in the acid solution was as high as 25 per cent by a sedimentation check. The acid was frequently discarded to the sewer when high sediment and low acid concentration would coincide.

To keep the mud from settling, air was injected in short blasts at the inlet to the condensers every half hour during the cleaning cycle. The air forced acid out of the condensers into the tank. After the air had vented, the acid level dropped approximately 50 gallons under what it was before air was introduced.

This happened several times, indicating that air had broken through mud which had "walled" off sections of the condenser. In all, about 200 gal of makeup acid were required to take care of this phenomena, which occurred on both pairs of condensers.

HELI-FLOW COOLERS

HELI-FLOW coolers must be vented at the top to allow complete filling since the drain plugs are situated near the center, and cannot be used. Piping in these units is centrally placed, and a high circulation rate is necessary. Air agitation will not work since the air would form a pocket at the top of the jacket, preventing full contact by the acid solution.

COMPRESSORS

COMPRESSOR WATER circuits are cleaned with sulfamic acid and salt to remove water scales and rust. A small pump of 10 to 20 gpm is used to circulate the heated acid through the passage until all scale is removed. Time of cleaning varies from 2 to 6 hrs depending on the amount of scale and the circulation pattern.

MAGNETIC COUPLERS

AN INTERESTING specialized cleaning job was done on the magnetic coupling of a motor that electrically controls the process speed of a production unit. Descaling took place with the coupling in operation. Stainless steel and copper were in contact with the cooling water, which was taken from city pipelines. Flow was between the stator and rotor (0.030 in. clearance). Excessive heating indicated scale buildup. The cleaning solution could not be pumped in under pressure since it would penetrate the grease seal on the bearings.

A drum of sulfamic solution—thoroughly dissolved—was placed on the floor above the coupler. A direct drain line was connected to the coupler and the acid solution took the place of cooling water, which was turned off. Valves controlling both the acid flow and cooling water were side by side. When foaming ceased, indicating complete scale removal, the acid solution was cut off and cooling water flow was resumed.

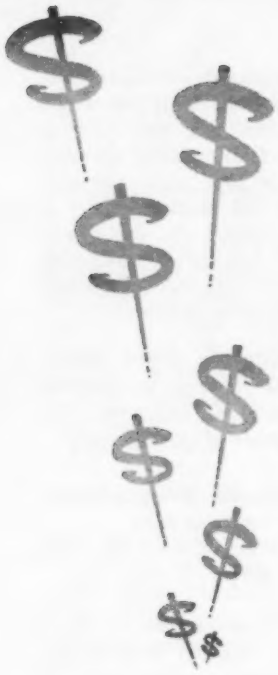
The solution was introduced cold, and depended on the heat from the coupler to elevate the temperature and create a faster reaction. Approximately 80 lb of acid was used, and the cleaning continued for two hours, with the machine running. Tearing apart the coupler would have cost approximately $150, excluding production loss.

SPECIAL DEPOSITS

PACKED STILL columns have been cleaned where iron oxides are part of the carbon deposit in the packing. The deposit must be in a wettable stage, and any liquids in the still which will prevent this must be removed by vaporization or flushing.

A large volume pumping unit is then set up to circulate a 160 F solution of 10 per cent inhibited sulfamic acid and 5 per cent salt. Circulation of the acid is from the still bottom or boiler up to the feed point where the acid is distributed over the packing. The acid percolates through the packing and dissolves the iron oxides, leaving the carbon as a silt which is readily removed with a hot water flush.

Our experience with sulfamic cleaners would enable me to recommend their use to anyone faced with the problem of equipment descaling. Some of the stills we have cleaned are more than 80 ft tall.



ARE BUILDING COSTS REALLY HIGH?

No, says this author, not if you build on a cost-per-occupant basis

By R. K. GAD, JR., Director, Office Planning Div., Shaw-Walker, New York City

AT ANY BUSINESS conclave you will hear that cost of office buildings is almost prohibitive. Some business publications glibly assert that structural costs, or mechanical costs, or both, present the big problems; others will assure you that it is the architect's desire for a monument to his talent that drives the costs sky high.

After many years of consulting experience in the field of office planning I am convinced that none of the above has very much effect on the ultimate cost of the building. Building cost is just about what the owner is willing, or is induced, to pay.

Costs begin to spiral when original economy objectives are tempered, altered, or abandoned entirely by management in the face of internal pressures, fallacious assertions bordering on old wives tales, improper weighing of aesthetic vs function, and vice versa, and sometimes in sheer intoxication over the new building.

I think none can disagree that in almost every case, the prime reason for any new office building is to house the people who perform the office function. All other considerations are but complementary to the housing function; yet, it is the careful and accurate evaluation of these considerations that not only affect the initial cost of the building but, also its long term, economic usefulness to the company.

A partial list of these other considerations would have to include: aesthetics, good will, company "front", efficient production, employee relations, financing, initial costs, maintenance costs, product publicity, and saleability.

Please note that these factors have been arranged in alphabetical order, since no two "experts" could agree as to their specific importance. And, what is more significant, a thousand arrangements and weighings would be necessary to fit exactly the requirements of a thousand different companies.

Let us examine some of these factors to highlight the problems involved in their evaluation.

1. Initial Cost—I am sure we would get almost universal agreement that it is short-sighted to save a dollar in initial cost, only to spend it many times over on maintenance cost, but I doubt we would get such general acceptance of the premises that:

Efficient production is unnecessarily hampered by too much space.

Too much space is more costly than too little.

Too much space is bad for employee relations.

We could rightfully expect some strong resistance from the treasurer if building styling materially affected the saleability or mortgageability of the building.

Last but not least on Initial Cost is the basis for calculating it. The usual yardstick is cost per square foot. In my opinion this has little or no bearing if we are already in agreement that the prime reason is

About the Author

A planning consultant since 1946, Mr. Gad served as a specialist in marine operation and construction during World War II. Prior to that time, he was affiliated with the Fairchild interests, both as secretary to Mr. Fairchild and as methods consultant on reorganization.

Table 1. Project and per capita cost of recent buildings including Hagan plant.

Year	Persons Housed	Project Cost	Per Capita
1953-54	1600	$4,375,000	$2733
	600	2,500,000	4166
1955-56	1600	19,000,000	11875
	1600	8,000,000	5000
1957-58	600	5,000,000	8333
Hagan Chemicals & Controls, Inc.	600	1,700,000	2833

housing. The only true measurement of housing is cost per occupant.

2. Employee Relations—Good employee relations will affect "efficient production" and "maintenance costs." Therefore "initial cost" should be increased, if necessary, to reduce noise, increase air conditioning, improve lighting, provide coffee areas, shorten work hours, etc. Personally I place "employee relations" at the head of the list of desired objectives but I don't agree with everyone on the best ways to achieve them.

I am told people think better in quiet surroundings, but I know there is no scientific or medical proof of this. I am told they like absolute quiet, but I know that the absolute absence of noise would drive them out of their minds in a matter of minutes. I am told low noise and isolation are essential to important decision making, but I know if this were so, there would be no laws passed in Congress, no decisions reached by jurors, no problems solved in the family kitchen, no airplanes flown, no trains run, no fires put out, no surgical operations performed, and last but not least, no newspapers published.

Since creature comfort, both physical and mental, is most important to good "employee relations" we are told air conditioning is a must for today's office. As a consultant I strongly recommend it to clients, not because I am completely sold on the statement that office people will do a single tap more work, but on the basis that a company must protect its investment.

For the same reason that the trade-in value of an automatic transmission car is better than a manual shift car the building owner must bow to the general concept of modernity. There are also gains in cleanliness and maintenance costs.

While we are on the subject of employee relations, let us not forget the psychological aspects of this subject. In this field there are as many half-baked amateur opinions as to what is good psychologically and what is bad psychologically as there are pebbles on the beach. Reconcile, if you can, the following "facts" offered, in good faith, sometimes by the same individual.

That:

Putting people in private offices:
Is good for ego, production.
Isolates them from the best team interests of the company.

That:

Putting people in open areas:
Is bad for their ego.
Welds a better team with high esprit de corps.

That:

Improvement in the morale of the lower echelons is more important than improvement of morale of the "brass".

Put the mail department in the sub-basement and the chairman in the biggest office in the best corner.

That:

Windows and vistas are important morale boosters.

Put ten executives on the perimeter and crowd 100 people into interior space, and then proceed to drape the windows heavily in the 10 offices so that the "brass" will not be confused by outside distractions like nice lawns, trees, birds, etc.

Actually, it is quite simple to make everybody completely happy by adhering to the following: It is not important what you allocate to anyone as long as no one has any better. Next to this, your only hope is to develop a plan so meticulously equitable that contemporaries and counterparts, whatever their echelon cannot find any difference in their personal treatment. This won't necessarily make them happy, but it is guaranteed to be good psychologically for "employee relations".

3. Efficient Production—This might be the most important item for long term economic gains. Unless detailed planning can definitely prove gains in communications,

Elegant finish of new Hagan building belies comparatively low building cost.

President W. W. Hopwood in his office in new building where private offices were decorated for individuals.

work flow and procedures, the new building might better be abandoned. But, since the annual payroll earned by the occupants will exceed the total cost of the building, careful attention to this phase could easily make the building pay for itself in a few years.

Economic Advantages

Let us examine one of these projects—the new office building of Hagan Chemicals and Controls, Inc. —which combines office and research laboratory—and see what makes it tick. My reasons for selecting this particular project are: it is current, low cost, and I am familiar with all of its details, having been involved in its planning with W. W. Hopwood, President of the company and R. R. Donaldson, Vice President who was assigned the responsibility for costs, contracts and execution. Mr. Hopwood is one of the school that believes management should manage and he had to be convinced as to the economic advantages of any proposals I made.

If you do no more than examine the cost of this building you would reasonably assume that here is a "jerry built", low-cost, poorly-appointed, ill-functioning, stop-gap structure, built by a company with little or no building ownership experience, possibly misguided into providing poor accommodations for its employees, and needlessly buying high future maintenance costs.

Let's Look Inside

Nothing could be further from the truth. This building was built by a company that is no novice in this area, having operated and maintained its own buildings for many years. With this background, "present cost" lost every decision to quality, long life and low maintenance in the selection of materials and methods of construction.

It would be equally erroneous to assume the building is poorly appointed since it is fully air conditioned, acoustically treated, extremely well lighted and colorfully decorated. It also has a scientific library containing 4000 bound volumes and thousands of research pamphlets and technical abstracts.

Every window in the entire structure is draped with expensive casement cloth in lieu of blinds, one whole wing is carpeted wall to wall, and paneled in oak, teak, cherry or mahogany. Each private office occupant was offered a choice of decorations, including pictures, lamps, furniture and ash trays. All toilets and wash rooms are finished in ceramic tile with colored fixtures.

Again you would be wrong to believe that while all this was going on inside, the exterior was neglected. The structure is of brick and quarried stone, with aluminum window and door frames, fully landscaped, and with a paved parking space for every employee.

I can now almost hear the conclusions that these people had no site problems. Don't bet on it. The building was constructed on a hilltop over an abandoned mine. For this reason it was necessary to relieve the overburden by an amount equal to the weight of the structure by removing hundreds of thousands of cubic yards of hilltop. For the laboratory, a complex dual sewerage and waste disposal system had to be installed.

Also let me hasten to assure you that the employees were not shortchanged in this project, as is so often the case. There is work space desk space, aisle space, coat space, all using standard tolerances, per employee equal to or better than that in buildings shown in Table 1.

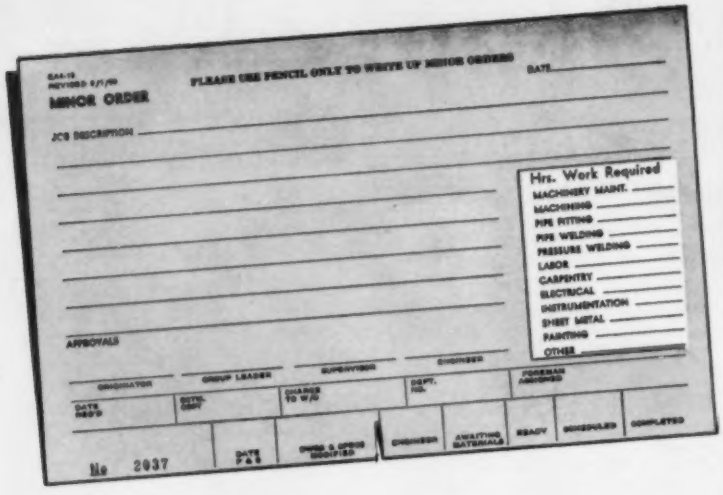
Formula for Building

Every employee has a clear view of the countryside, is seated within 35 ft of a window and within 100 ft of building facilities including toilets, stairways, etc. There is an excellent cafeteria with a fine kitchen completely equipped in stainless steel. Although the building is only two stories high, elevator service is available.

Buildings like this don't just happen any more than good lawns happen. There is an old formula for a good lawn; good fertilizer, good seed, and a barrel of sweat. Good planning, good execution, plus the sweat will get you a good building. but if you want an exceptional one like that of Hagan Chemicals and Controls, Inc., at these prices, you need one more very important ingredient—an active and diligent corporate management. **End**

WORK ORDER SYSTEM Gives "At a Glance" Information

No lost jobs . . . record of total manpower backlog . . . complete check on all orders . . . are advantages of system



By **RALPH JONES, Planning and Scheduling Supervisor, Engineering Department, The Chemstrand Corporation, Decatur, Alabama**

WHAT, ANOTHER new system? Yes! But one designed to give answers—answers that really make it a status control system. Look at the items listed. Is your present system giving this information? If not, it will pay you to read on.

Following is a brief description of the minor order procedure from initiation to completion of the job:

1. Information on the status of every Maintenance Minor Order from the time it reaches the Planning and Scheduling Department, until it has been completed and inspected and approved by the originating party is available in a matter of seconds.

2. No lost jobs; every minor order is active from the time it starts until it is completed.

3. The total number of minor orders in each step, (Engineering, Awaiting Materials, Ready for Work, Scheduled, Complete and Awaiting Inspection by the Originator) is available for each department at a glance.

4. The total manpower backlog for each foreman in the "ready to work" status can be calculated quickly.

5. Special status indicators can be used to indicate at a glance special minor orders, old minor orders, etc.

6. The drawers can be removed and with the use of a XeroX machine and a Multilith machine all this information can be transferred to paper in from one to two hours and put into the hands of all interested parties. See Fig. 2.

No, it is not a cure-all. The success of this system, like all others, does require the following of procedures, and it must be recognized by those who are a part of the system.

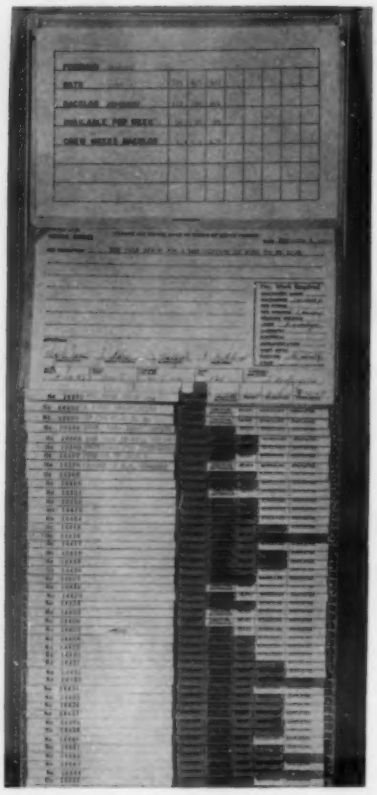


Fig. 2. The minor orders are moved on filing trays and are machine copied.

Fig. 1. Information on the minor order is reproduced on three tinted copies.

When properly used, it will tend to reduce the backlog of work, make maintenance crews more quality conscious and reduce lost manpower by having materials and information on hand and a planned work schedule.

Materials required for the system are as follows:

1. Visible Records Control and stand for 5-by 8-in. forms.

2. Sufficient number of pockets with paper hangers to handle the total backlog for plant, complete with status indicators.

3. Minor order forms designed for the system. These to be in quadruplicate and four colors.

The status of all minor orders assigned to a foreman can be determined quickly and the status of each individual minor order as well. In a few minutes the time estimates shown on the right hand of each minor order form can be added and the total backlog calculated. No jobs are lost since the originator's signature is required before the job is closed out.

Several other features can be a working part of this system:

1. Small tabs of different colors or

locations in the pocket can indicate the age of the minor order, required completion date, emergency requests, etc. See Fig. 2.

2. The status being marked as each step is completed will give an average period of time to be expected with normal flow from origination to completion.

3. Weekly meetings can be held with interested parties and the overall status of work discussed.

Allowance is made for men needed for preventive maintenance and routine maintenance and only those men not assigned are scheduled.

Since there will be emergencies, over and under estimates of jobs scheduled, etc., a sufficient number of jobs is placed on schedule that can be done or left undone to allow for fluctuation.

Minor Order Procedure

The schedule has a place for charge numbers, minor order numbers, engineer's name, a brief description and manpower required by the day of the week. See Fig. 1.

1. The originator completes the minor order form, keeps the fourth or yellow copy and passes three to the Planning and Scheduling Department. See Fig. 4.

2. Planning and Scheduling checks for correctness of charge numbers, for engineering work, etc.

3. The first two forms (white and pink) go to the departmental drawer in the control cabinets. The status tab for this minor order is moved to the proper position and the date written.

4. The third or blue copy goes to the engineer (when engineering work is needed). A bill of materials, sketches, prints, and all other information necessary to complete the minor order are returned to Planning and Scheduling.

5. Planning and Scheduling reviews the minor order with the general foreman assigned to complete the job, and a manpower estimate requirement is made of each craft required.

6. The blue copy along with complete information is put into an envelope or folder and placed in the general foreman's "Information Ready File" until scheduled.

7. At the same time, the second or pink copy of the minor order is moved from the departmental drawer to the foreman's "Ready Drawer" in the control cabinets. The time estimate is indicated on this copy and if several crafts are required, this is so indicated.

8. From the Foreman's "Ready File" a weekly schedule is made out as a guide for the coming week's work, Monday through Friday. Copies of this schedule go to all interested parties. From this schedule the foreman's daily work sheet for each man is made.

9. If for any reason the foreman is unable to complete his schedule because of emergency breakdowns, error in original manpower estimates, etc., he contacts the Planning and Scheduling Department and they in turn revise the schedule as needed.

10. On Thursday morning of each week a check is made with each foreman on the status of each job scheduled so that carryover jobs can be determined. The schedule for the week following is completed on Thursday and is distributed by nine o'clock on Friday morning.

11. As jobs are completed, the foreman or his representative will contact the originator advising him of the job completion, inspect the job with him and obtain his signature on the work copy (third or blue). This officially closes this job and Planning and Scheduling clears all files.

System Roadblocks to Watch

1. Fighting the system. If the person requesting the work is able to deal directly with the man or foreman performing the work, the system will only be used when direct contact is not successful.

2. Incomplete engineering details, such as prints, materials, etc.

3. Emergency jobs. Most emergency jobs are in name only to rush completion of a job ahead of other departments.

4. Failure of maintenance crews to fully read the instructions before returning to Planning and Scheduling for more information.

5. Equipment is in use at the time a job is ready to go. **End**

Fig. 3. Clerk can readily check information on minor repair orders stored in compact cabinet located in large office in the central shops building.

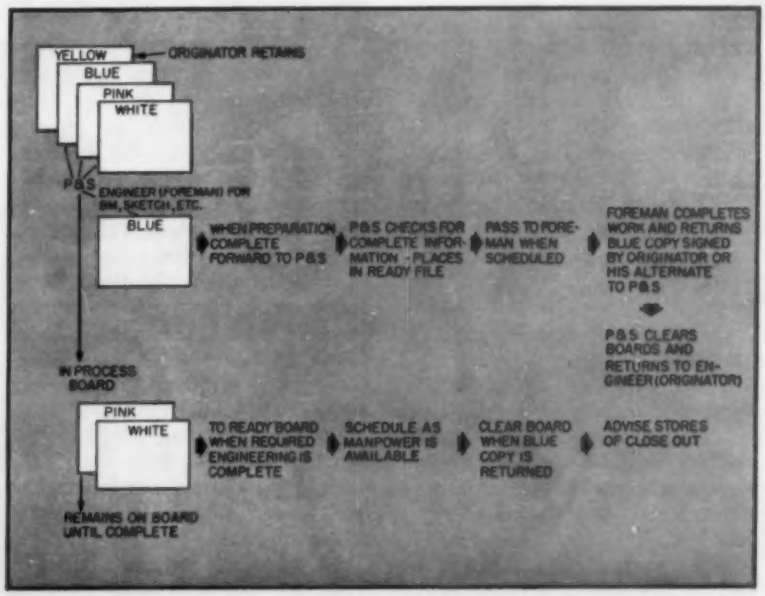
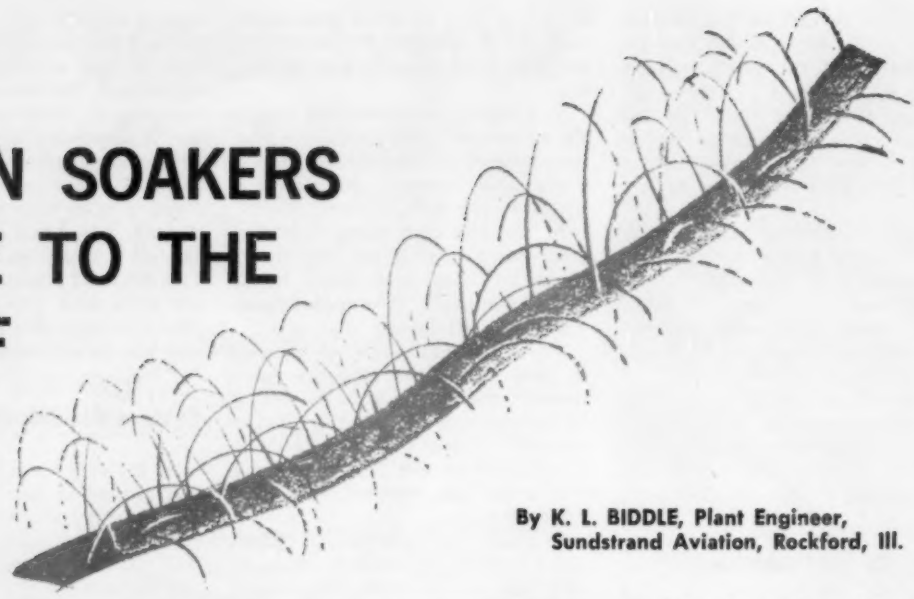

YELLOW
ORIGINATOR RETAINS
BLUE
PINK
WHITE
P&S
ENGINEER (FOREMAN) FOR BM, SKETCH, ETC.
BLUE
WHEN PREPARATION COMPLETE FORWARD TO P&S
P&S CHECKS FOR COMPLETE INFORMATION - PLACES IN READY FILE
PASS TO FOREMAN WHEN SCHEDULED
FOREMAN COMPLETES WORK AND RETURNS BLUE COPY SIGNED BY ORIGINATOR OR HIS ALTERNATE TO P&S
P&S CLEARS BOARDS AND RETURNS TO ENGINEER (ORIGINATOR)
IN PROCESS BOARD
PINK
WHITE
TO READY BOARD WHEN REQUIRED ENGINEERING IS COMPLETE
SCHEDULE AS MANPOWER IS AVAILABLE
CLEAR BOARD WHEN BLUE COPY IS RETURNED
ADVISE STORES OF CLOSE OUT
REMAINS ON BOARD UNTIL COMPLETE

Fig. 4. This illustration gives an idea of flow of the paperwork involved. The white original and copy go to Planning and Scheduling Office.

LAWN SOAKERS TAKE TO THE ROOF



By K. L. BIDDLE, Plant Engineer,
Sundstrand Aviation, Rockford, Ill.

Heat inside the plant during the summer months has been cooled considerably by the installation of this spraying system

SEVERAL YEARS ago we decided to do something about the high temperatures in the plant during the hot summer months. After considering various possibilities we decided that some method of roof cooling would correct our problem.

As the "hot summer months" were already with us, we wanted immediate relief. This was accomplished by purchasing perforated plastic lawn sprinkler hose and hooking it to the city water supply with temporary piping. As a result of this simple connection we were "in business."

Once we were operating on this temporary basis, we took a second and more scientific look at the situation to devise a more permanent system. The first step was to decide on what type of roof cooling we should install. Should it be a spray system or should we have a pond?

We studied both systems to see which one would be suitable for our use. The spray method subjects the roof to no more demands than a light rain. In fact, by keeping the roof temperatures down it would also preserve the life of the roof. With a spray system, warm water can be used which means that water already used in some process in the plant might also be used again to cool the roof.

A pond, on the other hand, subjects the roof to hard usage and must be drained to do any maintenance work (such as repairs, painting of equipment on the roof, etc.). Further, ponds are breeding places for mosquitoes, algae, fungus and bad odors. This fouling of the surface reduces the cooling effect. In addition, the pond has a heat storage effect after the sun is down. A running blanket of water eliminates some of these objections, but it is difficult to distribute a lot of water satisfactorily.

Since roof cooling is evaporative cooling, we felt that the spray method would be more effective than a pool of water or a blanket of running water.

The next step was to obtain information and quotations on commercial roof spraying systems. Because our temporary system seemed to be effective, we included an estimate of revising it into a permanent system. The cost of a commercial roof spraying unit would be about 50 per cent more than what it would cost us to convert our temporary lawn hose sprinkler system into a permanent installation. Needless to say, we decided to build our own.

Effectiveness of any system of roof spraying depends upon the quality of the job of wetting the roof. Our system depends upon positioning the soakers so that the excess water—because of the pitch of the roof—drains to moisten those areas not directly sprayed. The purpose is to minimize the amount of water and number of lawn soakers required.

We estimated our water usage at

Fig. 1. Pump supplies 200 gpm at 60-ft head; at farthest hose, 20-ft head.

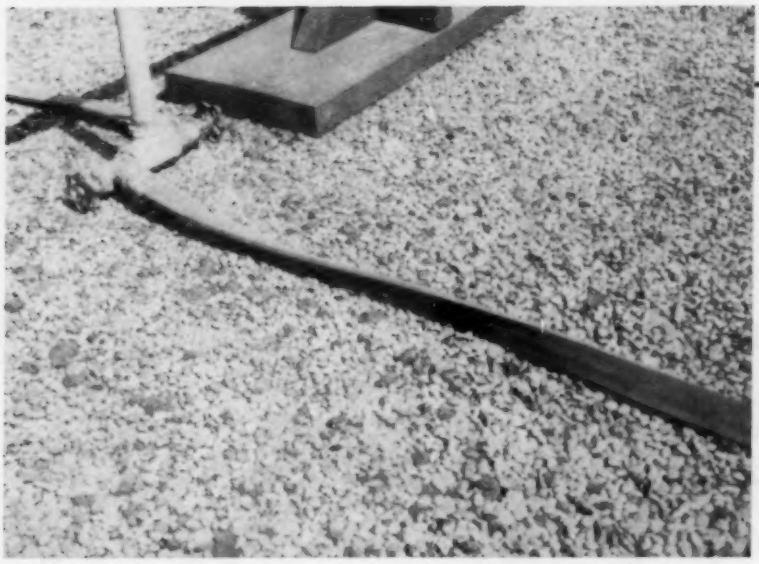


Fig. 2. Closeup shows how piping from overhead line connects to soaker.

six to eight times that claimed by similar commercial systems. But, since we ultimately hoped to use the plant's cooling water which was now being discharged after use, this was not too important.

Here are some details of the system we installed: The roof area is approximately 200 by 500 ft. The main distribution pipe is three inches in diameter. Branch lines leading from it are smaller. Three-quarter inch crossfeeds are located at about 100-ft intervals. The lawn soakers are 50 ft long and each covers an area of about 1800 sq ft. The pump supplies approximately 200 gpm at a 60-ft head. Generally a head of 15 to 20 ft is required at the farthest hose. The performance of the system has been very satisfactory.

Roof temperatures can be quite high. We have had some temperature readings as high as 125 F—and this in mild weather. At such temperatures the air on the roof can be reasonably dry even when a relatively high humidity condition exists. We have found that outside roof temperatures can be lowered as much as 25 degrees with roof cooling.

We have not made any quantitative measurements on inside temperatures, but our experience has shown that they are noticeably lower.

Roof cooling is also recommended to cut down on your air conditioning requirements. For example, the rate of heat flow through each square foot of roof is obtained by multiplying the overall heat transmission coefficient by the equivalent temperature differential across the roof. Tables published in the ASHAE Guide indicate values of equivalent temperature differentials for sprinklered roofs to be only one third the maximum of that for roofs exposed to the sun. Where the roof is an appreciable part of the cooling load, this becomes quite significant.

Because of the success with our first roof cooling experiment, we have also installed sprinklers on the roof of an air conditioned area in the plant. Our computations indicate that the cooling load will be reduced by 15 tons as a result of the sprinklered roof. This area is approximately 20,000 sq ft, and we are using 45 to 50 gpm of cooling water. Incidentally, the 15 tons of air conditioning it replaced would require about 20 gpm of cooling water, so the net water usage is not the full 50 gpm. Estimates for sprinkling (using city water from the mains) came to about $800, compared to $3000 for 15 tons of air conditioning. **End**

Fig. 3. View of one section of the roof area where the three-inch pipe feeds water into one of the branch lines.

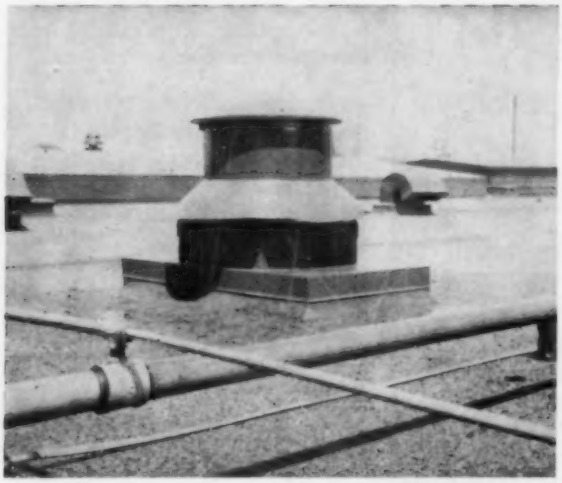
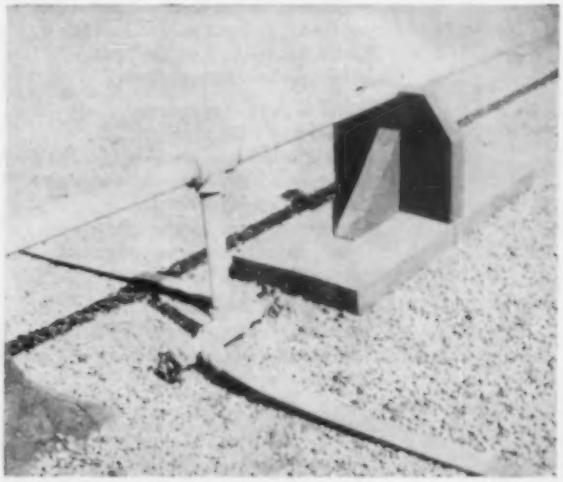


Fig. 4. Closeup of one of the wooden supports used for the branch lines. They are also used for the three-inch line.



CHECK INDUSTRIAL DRAWINGS FOR SAFETY

Here is one other way you can reduce plant accidents. Carefully review your drawings to detect any unsafe conditions.

By F. JOHN EGGERT, Mechanical Engineer, Hamburg, N. Y.

BEFORE YOU SIGN
CHECK YOUR DRAWINGS AGAINST THIS SUMMARY

1. Basic Design:
   - ___industrial codes and practices
   - ___hidden defects in existing structures
   - ___reversibility and substitutes
   - ___vibration, speeds and loads
   - ___thermal expansion
2. Installation:
   - ___buried pipelines and conduits
   - ___weather conditions and inflammability
   - ___erection loads and handling
   - ___points of critical workmanship
   - ___adjacent equipment and operations
   - ___clearances
3. Operation:
   - ___access and escape routes
   - ___visibility and working clearances
   - ___foolproof safety devices
   - ___positive identification and signals
   - ___accidental actuation
   - ___unattended, inactive and restarted
   - ___fumes, health and explosions
   - ___color uses and housekeeping
4. Maintenance and Inspection:
   - ___access and walkways
   - ___fixed lighting and positive identification
   - ___clearances from dangerous equipment
   - ___safe area occupancy
   - ___disassembly and pinch points
   - ___falling objects and hoist capacity
5. Emergency:
   - ___automatic equipment
   - ___warnings, time and escape routes
   - ___lighting and emergency controls
   - ___access by emergency crews

Note: Use this check-off list to eliminate all possible hazards. When drawings have been checked for safety, initial safety check space in the drawing title box.

WHENEVER YOU install new equipment, adopt a new process, or alter a routine operating procedure, why not detect the accidents before they happen?

Your industrial drawings offer a preview of future accidents. Yet, the fine art of detecting them on drawings is often overlooked. Here is a method of detecting hazards before they are built-in.

By detecting the setting for accidents during the drawing stage of development, the plant engineering department can:

(a) correct the problem, rather than rely on the human element to apply safe practices,

(b) alter the design or arrangement to eliminate hazards,

(c) furnish better guards, or other safety devices, than shop maintenance personnel might provide from makeshift materials.

Start With Safety in Mind

The first step is to make safety-study as much a part of the design as production and costs. To furnish some perspective, consider the extremely hazardous conditions that were acceptable in years past that are now unthinkable on the basis of both insurance costs and industrial relations. Therefore, it follows that further reduction of hazards is now

Republication rights reserved by author

as continuous a demand as advances in production methods.

Hazards are detectable on all types of industrial drawings. Potential accidents can be previewed on: the plot plan, excavation diagrams, assembly or arrangement drawings, electrical schematics, structural design sheets, erection diagrams and even on the detail sheets. It only requires a little time and thought to analyze a set of prints for hazards by using a checklist.

Applying the Safety Checklist

To illustrate the safety hazard of the seemingly minor items on the checklist, consider the effect of thermal expansion as shown in Fig. 1. In this example, the steel plates were installed to protect the concrete walls from being battered during crane magnet operations.

Although the safety hazard of a minor amount of heat being applied to a structure is easily overlooked on a set of drawings, it was apparent to all when the wall collapsed and the office sagged. No doubt, similar occurrences within your plant would illustrate many other items on the checklist.

A misleading conception of the stability of existing structures can be obtained during a study of the drawings for a plant modification. Hidden defects in existing structures contribute to accidents due to overloading. Figures 2 and 3 illustrate defects of this type that the checklist highlights as requiring on-the-spot investigation.

Another hazard affecting the stability of existing structures is unauthorized alterations along with usage that was not included in the original design. This situation is simply illustrated in Fig. 4. It is surprising how often this occurs in many industrial plants.

While examining drawings for safe basic design, determine that the features are included to prevent the reversability of a unit wherever such malpositioning would be hazardous. In addition, examine all connections of units to insure that they are sized to prevent any possible connection to higher capacity units. Ordinarily this is a practice with electrical equipment, but it should also be applied to mechanical and hydraulic units.

Throughout your consideration of the basic design, remember the variety of hazards that are developed by the application of substitute equipment that is not approved. For instance, if a special lockpin is provided, it should be mounted to prevent loss and substitution.

Another hazard easily overlooked, but brought to mind by the checklist, is transient vibration. The harmonic effect of vibration can turn into a hazard by causing adjacent piles of stock to "walk" until overbalance causes overturning.

After the basic design has been checked out, determine the hazards that will be present during installation of the new equipment.

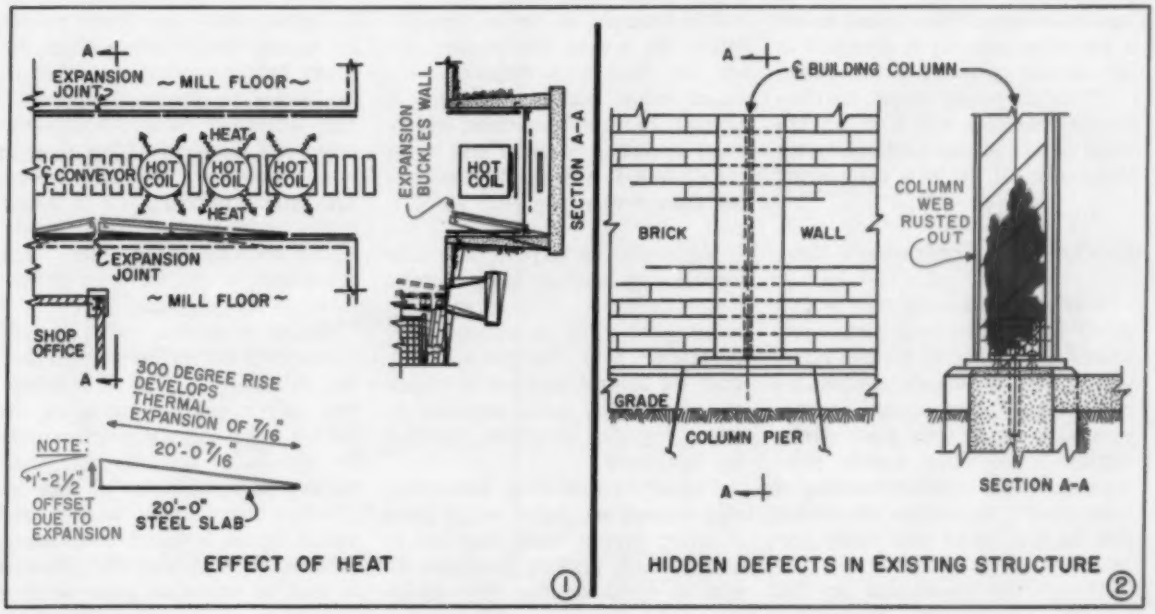
When examining the excavation diagram, the location of conduits and gas lines is of primary importance. Use of standard safety notes on the drawing for locating, exposing, and identifying such known buried hazards by *hand excavation* before using power equipment is a step in the right direction.

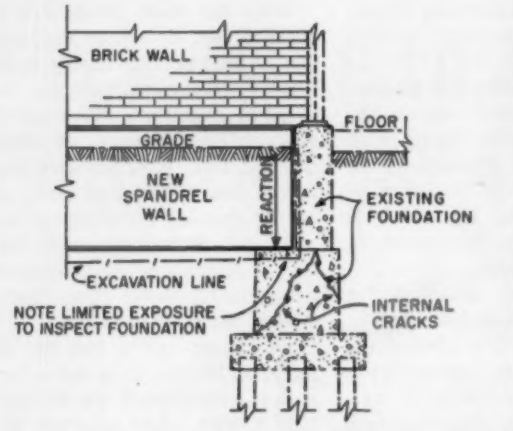
Of course, seeing that the safety notes on the drawings are complied with is a function of the administration of your safety program. Seeing that you do not overlook them is a function of the checklist.

Consider Weather Conditions

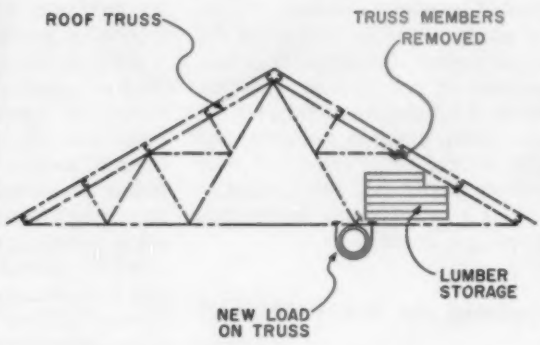
Another hazard to consider is whether or not particular trade practices will be hazardous at the time due to weather conditions. For instance, leading-in anchor bolts when moisture is in the hole can cause an explosion, so special grout should be specified whenever such a condition exists.

Safety while conducting adjacent operations is also on the list for your consideration. This is a reminder to rope off and identify construction areas along with pro-





HIDDEN DEFECTS IN EXISTING FOUNDATIONS ③



UNAUTHORIZED ALTERATIONS TO EXISTING STRUCTURE ④

viding markers for alternate routes for foot traffic.

In analyzing a set of prints for safe installation, picture in your mind just how each section is going to be hoisted. The checklist will remind you of features to consider. Where will the erection crane be spotted on the erection diagram? What is the actual clearance from power lines? Is adjacent piping exposed and unprotected? Are adjacent structures going to be temporarily overloaded, or will any part of the new installation itself be overstressed during erection? Is any prefabricated section too long to handle or install? Now check to see if the crane capacity is adequate in the various positions of the boom.

If any temporary power distribution is required, will it be an unusual hazard at any time during the installation of the new equipment?

Don't Forget Contractor's Men

While safe practices may be diligently followed by your plant's personnel, remember to include safety supervision of outside contractor's men who are often engaged for specialized work in your plant during modifications. Their unsafe practices and lack of understanding of your plant's operations can cancel out the benefits of your safety program.

Design the installation so that safety equipment must be used because there is no way to avoid it. This includes elimination of the possibility of "gimmicking" equipment to obtain more speed or easier operation. This popular practice usually involves jumpers to lock out relays, controls or limit switches which remove the safety factors you are counting on during the designing stage.

Check the design and installation of all purchased equipment shown on the drawings in order to filter out the dangerous phases of its operation. Ignoring minor details of design could prove fatal.

For example, is torque applied before the brakes are released, or are the brakes momentarily released before the motor torque is applied? In short, understand clearly every operation of every unit in an installation. It is better than analyzing what went wrong after an accident.

No doubt the layout physically located the operator and controls remote from any hazards and provided good visibility of the entire operation. Now include a safety study of control location in regard to this visibility being obscured by steam, fog, dust or smoke, or moving equipment.

Further, check that emergency stop buttons are within actual reach of every person when they are in *any* of their working positions. In normal operation the new equipment may be safe, but provide something substantial for personnel to hide behind when material being processed gets out of control.

Study the approaches to the control area. The control area itself may be safe, but can it be reached and vacated safely at any time? Is there an emergency escape route? An everyday example of this situation is the ordinary overhead electric crane.

Plan Emergency Routes

Often access to the crane cab is hazardous and emergency routes are usually non-existent. When the power fails, returning the crane to the access platform is impossible. The alternate escape route—the crane rail platform—takes time to reach, especially through smoke. This type of hazard is due to escape routes having been omitted from the layout drawing. Accordingly, they are noted on the checklist so that they are not forgotten.

Sound is another safety hazard that should not be overlooked during your study of a set of drawings. Not only is sound wearing on the nerves, but it can also disguise audible signals. In such disguise possibilities, the installation of dual indicators using both audible and visual signals is worth considering.

Another hazard on the checklist is that of explosive gases or dust

explosion factors combined with static electricity. Therefore, the drawings should include durable, well-grounded static pickups along with permanently mounted explosion meters as part of the original installation whenever these conditions are prevalent.

Study your set of prints to determine the hazards of maintenance and emergency repairs. For instance, routine design of an installation will provide safe access to maintenance work areas via fixed ladders and platforms, but do not overlook the auxiliary features of safe maintenance.

Maintenance Safety

Among these features are: fixed maintenance lighting, positive identification of fluid lines and electrical circuits, adequate clearances from adjacent dangerous equipment, safe spaces for maintenance personnel that are not dangerous pinch points during disassembly or reassembly of machinery.

Include also such features as: padlock fittings on controls and switches, auxiliary safety stops, area occupancy markers, permanent instruction notices, brackets for flasher mounts, and whatever else is necessary to eliminate accidents while you have your head in the lion's mouth. In addition, you will find that maintenance or repairs will progress faster when this security is furnished.

Examine the various components that must be disassembled and add lifting lugs where necessary. Although the drawings usually provide conventional lift beams over the units, consider the design of special spreaders and slings to make such lifts safer. This equipment will be needed sometime, so it may as well be provided along with the new equipment rather than depend on a baling wire device contrived as an emergency measure.

Give some thought to the redesign possibilities to eliminate a large amount of disassembly during maintenance or repairs by repositioning equipment for disassembly clearance. Also investigate the possible addition of large access doors along with alterations necessary to make an entire wall of a unit easily removable for safer maintenance.

In the matter of positive identification of fluid lines, electrical circuits, etc., permanently posting maps of your plant's facilities where they will do the most good will reduce the accident potential during breakdowns and also reduce the downtime. Everyone is aware that the drawings in a file cabinet a mile away are of no use in the breakdown area.

The final safety check to be made on your drawings should include analysis of the hazards created by automatic emergency equipment. For instance, determine if adequate evacuation warning will be given before the inert gas or steam fire quenching system goes off. Also check that the escape routes and time lapse are adequate for the number of personnel involved.

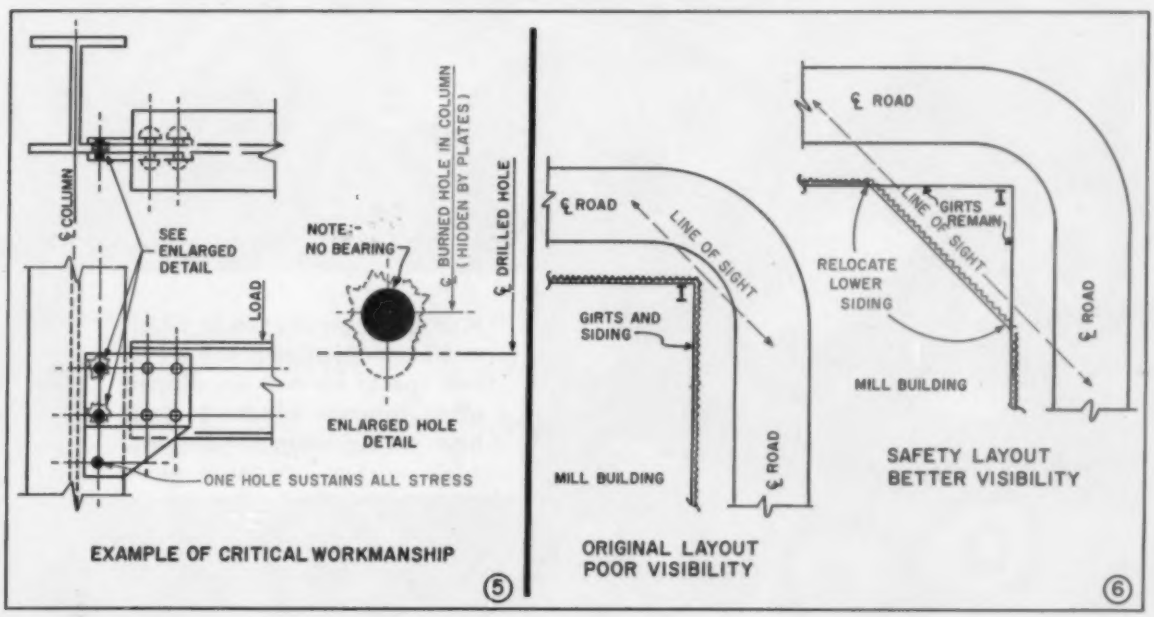
Now determine that the drawings provide permanent, clear identification of the main power switch and the main shut off valves for inflammable fluids or gases. Here again the safety study of drawings would point out the advantage of emergency controls being isolated to provide better access during emergencies.

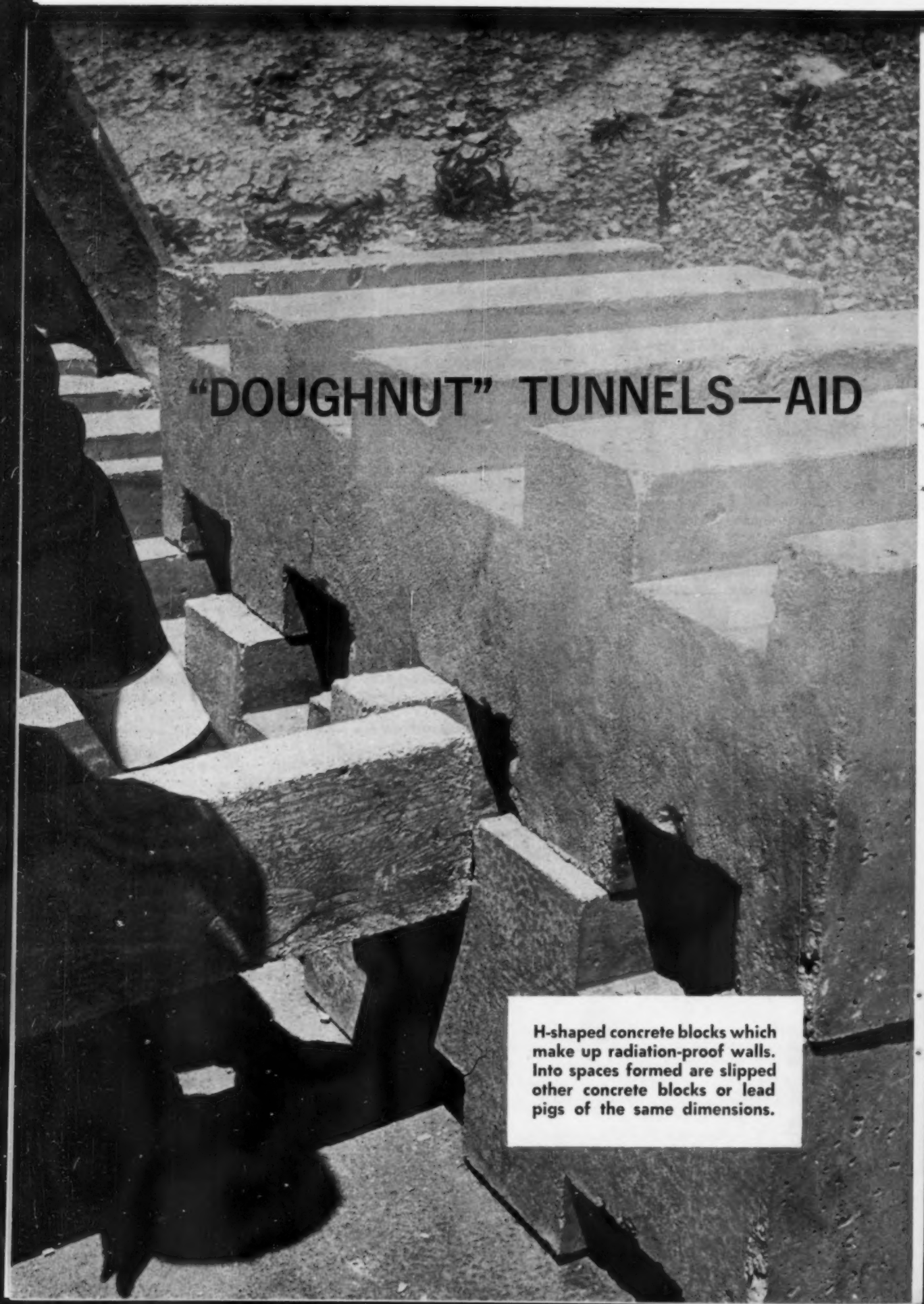
Accident Cost Is High

Accidents need not be spectacular to be expensive. Of course, just one serious accident can put a plant out of business if sufficient equipment is destroyed.

Accordingly when designs are being studied to increase production a nominal percentage, a safety study of the drawings will assure that the production increase will result in a profit, rather than incur a loss through accidents.

Preview the "accidents" on your drawings before you sign. You will find that there is money in it as well as peace of mind when the title box of your drawings includes a notation that a safety study has been made. **End**





"DOUGHNUT" TUNNELS—AID

H-shaped concrete blocks which make up radiation-proof walls. Into spaces formed are slipped other concrete blocks or lead pigs of the same dimensions.

Underground accelerator building is covered by earth. Shown is control building, entrance to adjacent building.

Lower core of doughnut-shaped utility tunnel has its ceiling hung with lab utility piping.

TO MAINTENANCE

CIRCULAR UTILITY tunnels (a maintenance engineer's dream) . . . radiation sniffers . . . underground buildings . . . 6-ft thick concrete-and-steel doors shielding against nuclear contamination . . . such is the workaday domain of plant engineering at General Atomic's $10,000,000 nuclear lab near San Diego, Calif.

Unique to plant engineering are General Atomic's circular tunnels that run through the heart of the circular Science Building.

The tunnels, flanked on either side by labs, not only pipe all utility services to the labs but completely isolate maintenance men charged with upkeep of the service. In effect, although maintenance men work within arm's distance of critical labs, and on lab level, they seldom enter . . . all hookups terminate within the tunnels.

Says one plant man, "It's a little like working in one of those reach-through kitchens. The cook serves dining rooms on either side but never really leaves his grill."

According to General Atomic's plant engineer, "Underground utility tunnels are, by now, an old story. But there's never been, to our knowledge, anything like these circular tunnels. They're a maintenance man's dream."

Called the mechanical core, utility tunnels are wall-hung with piping that supplies: 1. Domestic cold and hot water. 2. Hot water at 180 F for building heating. 3. Compressed air at 125 psi. 4. Vacuum at 5 to 6 lb. 5. Chilled water for air conditioning—supply and return. 7. Gas for the labs.

Explains one engineer, "To understand the uniqueness of circular, building-high utility tunnels, consider how they're situated within the Science Building. Visualize a wheel that's cut in half, the two segments facing each other. Labs are arranged around the wheel's circumference and also around its hub. Between them lies the mechanical core."

Perpendicularly, the 25-ft high tunnel is divided into three zones.

1. Lower Core: This directly serves the labs on either side, carries wall-hung and overhead-run service piping. Utility runs, including electrical, feed into the labs off the core. In the core's concrete floor, outside each lab, are installed open flush tanks (which drain laboratory sinks, except where experiments are "hot").

2. Fan Deck Core: Here are situated the exhaust system's

(Continued on page 274)

In small building, sniffer-actuated valve motors start up if sewage is contaminated, shunt outfall to tank.

Fan deck level of circular utility tunnel showing air conditioning ducting and how it enters labs.

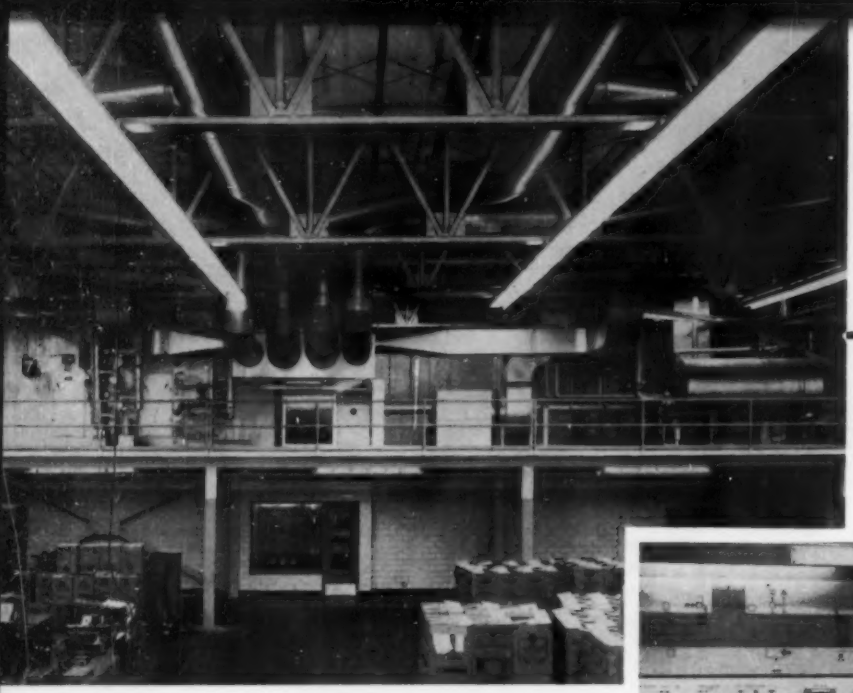


Fig. 1. View of mezzanine along south end of manufacturing area. Single fan-coil conditioner circulates completely conditioned air to seven work-bays. Seven other units plus this one distribute a total of 330,000 cfm of air.

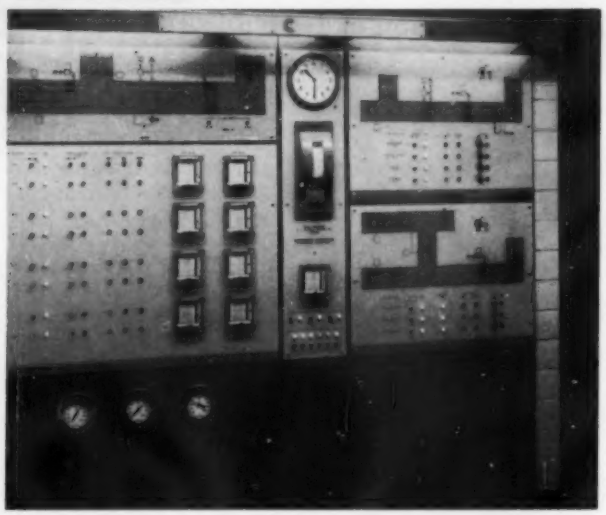


Fig. 2 Closeup of the supervisory control panel located below the mezzanine. Color-keyed lights permit instantaneous atmosphere readings anywhere in plant. Adjustment in temperature and humidity is made from this spot.

Eight Units With But One Aim . . .

YEAR-ROUND AIR CONDITIONING

System features:

1. Continuous filter
2. Special control panel
3. Mezzanine installation

BECAUSE PAPER will swell or shrink with changes in atmosphere and moisture, Continental Can Company wanted production operations at its new paper container plant to be under controlled conditions. To maintain a 75 F and 50 per cent relative humidity at all times at its Three Rivers, Michigan plant, the company installed eight central conditioning units.

One of the reasons for controlled conditions is because of the low paper tolerances required at this plant. They have been set as low as plus or minus 1/1000 of an inch. Unless the moisture content of air is controlled within the plant, individual fibers of raw paper either expand or contract from a sudden gain or loss of moisture.

When the amount of moisture in the air is low, paper has a tendency to curl and become brittle. Excessively humid air causes paper to lose its tensile strength and stretch easily. Paper experiencing either of these conditions cannot be used as containers and only has value as scrap.

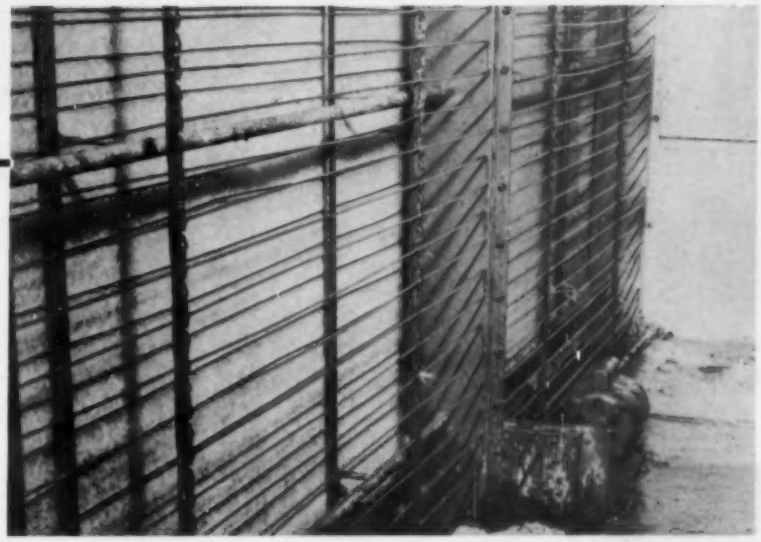
As a result of the air conditioning system the percentage of rejects has been reduced to an absolute minimum; container dimensions are kept precise and uniform regardless of outside weather conditions.

Another plus, in addition to maintaining container quality, is the environmental comfort in which the employees work.

The Three Rivers plant is a large, one-level structure covering approximately 380,000 sq ft, which is divided into four sections: manufacturing, warehouse, office and plant utilities. To reduce solar heat gain and facilitate maintenance of stable interior atmosphere conditions, exterior walls of the manufacturing and paper storage areas are constructed of insulated aluminum panels, from ceiling to floor. There are no windows.

Manufacturing comprises one huge area of the building consisting of large open bays—each 40 by 60 ft with high ceilings for running service facilities overhead. Here raw stock is printed, blanked (shaping of container), sent through forming machines and surface-waxed.

Fig. 3. View of one of the continuous filters which are located at the entrance to each of eight fan-coil conditioners. Filter unwinds from roll at top and moves down across the air passageway. Each roll lasts four to five weeks.



Coating food products containers with a wax film is a critical part of the operation. The wax applied must have a rigid surface when cooled to prevent leakage and for preserving contents. Wax and paraffin from five storage tanks is pumped through electrically heated pipes. When applied to the paper at very high temperatures the wax gives off a fine vapor.

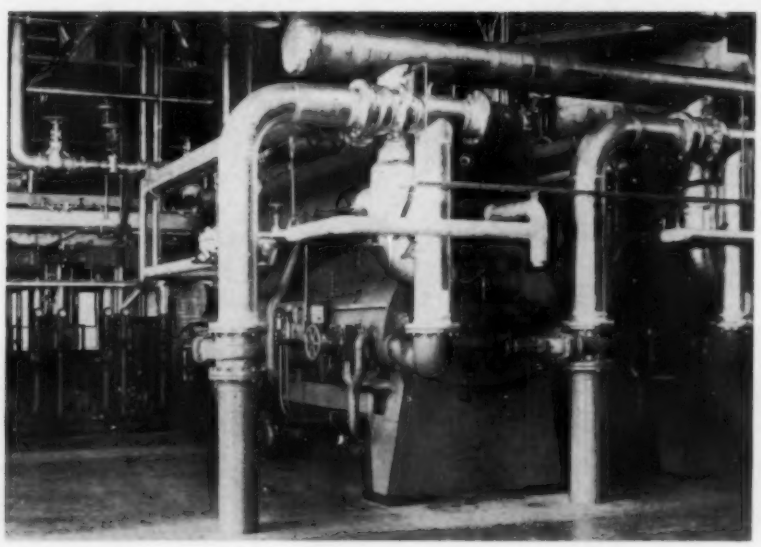
Keeping the plant air clean, as well as handling the problems of moisture and high temperatures, required that the Chicago architect-consulting engineers—Schmidt, Garden and Erikson—design a plant-wide air conditioning system strategically locating apparatus for effective air movement and control. The final decision: set up eight central conditioning units to serve separate systems. These units are located on a mezzanine along the south end of the manufacturing area.

Return air is pre-filtered before entering the conditioning apparatus. This is accomplished by a series of automatic, renewable, fiber glass air filters at the entrance of each of the eight fan-coil conditioners. These Roll-O-Matic filters, manufactured by American Air Filter Co., Inc., have continuous sheets which unwind from a roll at the top and move down across air passageway.

When resistance due to wax accumulation rises to a predetermined level, static pressure switches activate a motor, turning the roll until a clean filter surface is obtained. Each roll lasts four to five weeks.

In the plant boiler room two Carrier absorption refrigeration machines of 494 tons of cooling capacity each, chill 1180 gpm of 53 F water down to 45 F. The chilled water is pumped to the eight central conditioning units.

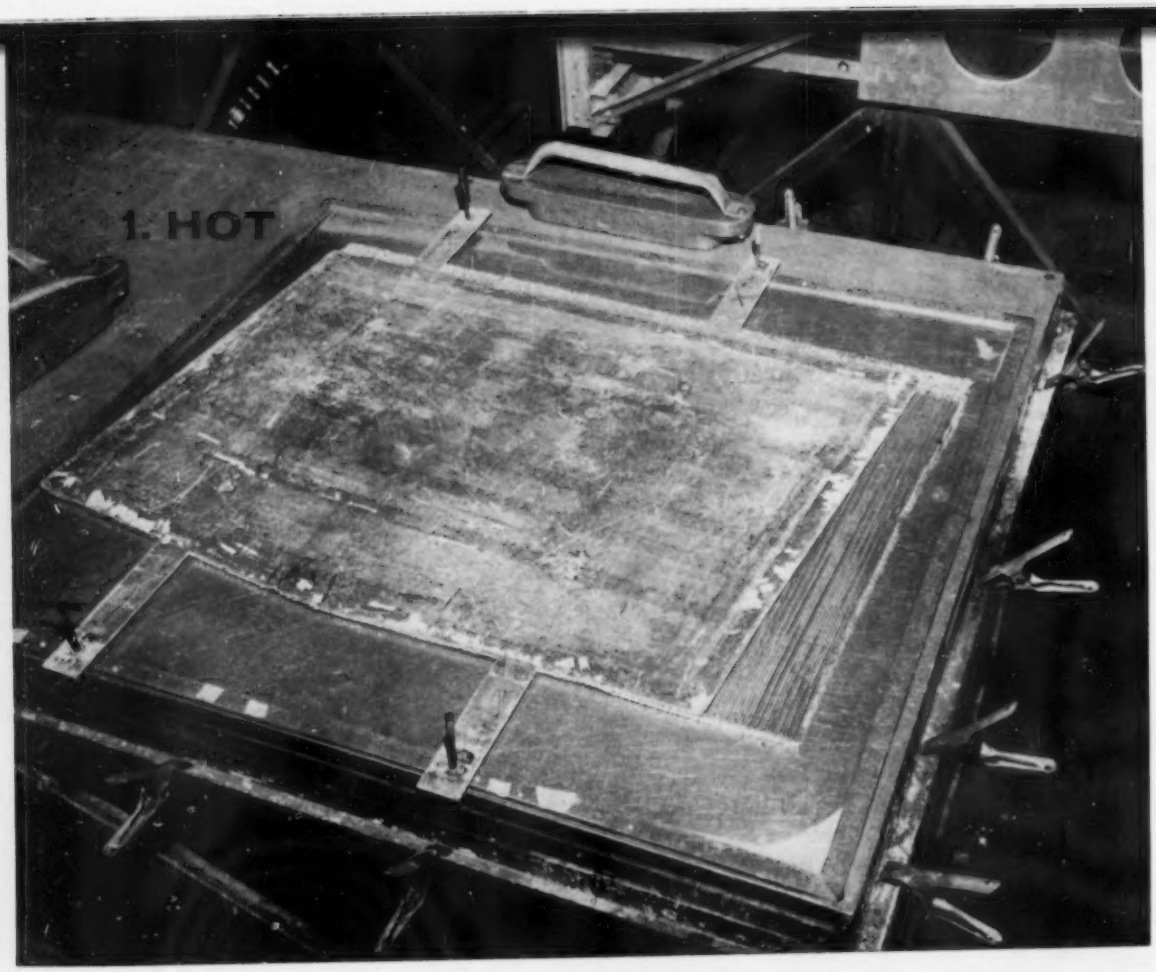
Fig. 4. These two absorption refrigeration machines (494 ton capacity each) provide 1180 gpm of chilled water and adjust automatically to cooling demands.



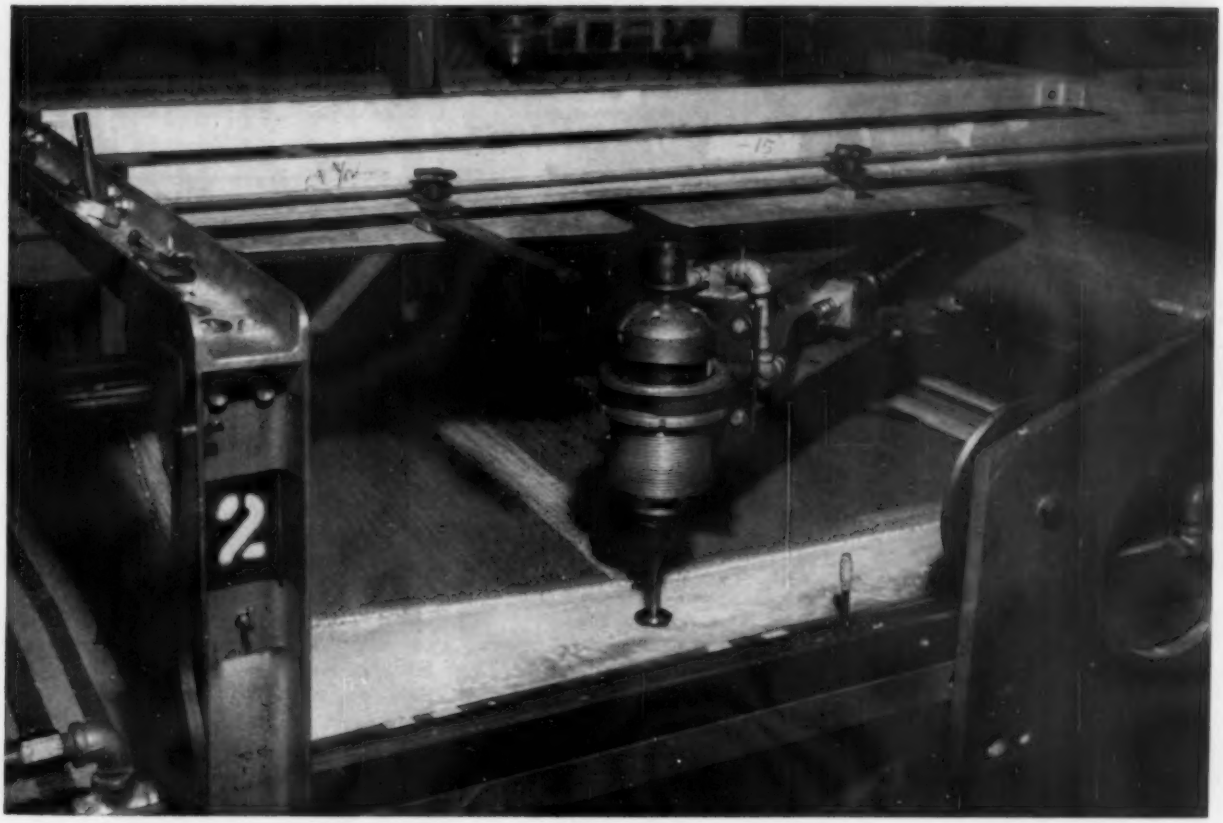
Each conditioning apparatus draws in a minimum of 25 per cent outside air, which is mixed with pre-filtered return air from the plant. The mixture is filtered again, cooled and dehumidified by chilled water sprays, and distributed at high velocity through overhead ductwork and ceiling diffusers. Small ducts were necessary to avoid interfering with process piping, sprinkler systems and lighting fixtures among the trusses and still maintain the 20-ft clearance. Total volume of conditioned air delivered to the manufacturing area is 330,000 cfm.

A supervisory control panel with color-coded schematic diagrams located in a closed room permits plant engineers to keep a constant watch of the entire system. Any source of malfunction can be pinpointed immediately and corrected. Temperature and relative humidity readings in the plant's key areas can be obtained instantaneously and any necessary adjustments made at once. Through a combination of switches, meters, signal lights and recorders, all system performance data and operational adjustments in controlling the plant's climate are made from this one location just off the manufacturing floor area.

Remote parts of the air conditioning system are observed and adjusted to meet changing load conditions and space use from the control room. Automatic controls make the fix, relieving service personnel of tedious troubleshooting when the system breaks down. **End**



HOT AND COLD TABLES



SPEED HONEYCOMB MILLING

By H. W. BRADSTREET, Facilities Engineer, Long Beach Div., Douglas Aircraft Co.

Top, left: On electrically-heated hot table a piece of rough-cut honeycomb material has been indexed in the tray. Melted polyglycol cement will be poured in and the tray will then be transferred to the cold table, below.

Bottom, left: On the refrigerated cold table, lead weights hold the honeycomb material firmly against the tray bottom while the cement hardens. Tray bottom will then serve as the "false skin."

Above: Here the indexing tray with its contents has been indexed on the bed of the milling machine. Template has been peeled away from the honeycomb and indexed on the milling machine superstructure above the honeycomb.

PLANT ENGINEERS in the hundreds of diversified manufacturing plants now using honeycomb-cored components in commercial and military products, will be interested in a recent development at the Long Beach, California Division of Douglas Aircraft Company which vastly speeds the milling of honeycomb cores by doing away with the false skin generally applied to hold these components during the machining operations.

The equipment was developed by company plant engineers in line with demands for an economical tooling program to produce parts for the huge, new Douglas DC-8 jet transport airplane. It consists of an electrically heated "hot" table 4 ft by 10 ft in size, a refrigerated "cold" table 4 ft by 12 ft in size, and indexing trays (which substitute for the false skin) for the setup of the honeycomb cores to be subsequently milled.

The process steps employed with these tables and trays are relatively simple. A running description of these process steps will do more in aiding others in duplicating this equipment and fitting it to their particular needs than blueprints of the equipment itself.

A piece of rough-cut honeycomb core material is first attached to its outline template by two-way adhesive tape. The template-honeycomb sandwich is then placed in one of the indexing trays, and the template is indexed in holes drilled in the rim of the tray. These tray rim indexing holes are, of course, correlated with indexing holes in both the bed and superstructure of the milling machine.

Please turn page

Pressing the guide on the cutter against the template edge, an operator proceeds to outline-size the rough-cut honeycomb material. The polyglycol cement keeps honeycomb in tray during any surface contour cuts that may be made.

HOT AND COLD TABLES

Liquid polyglycol cement, withdrawn through a light bulb-heated spigot from a heated tank at one end of the hot table (the polyglycol cement comes in powdered form) is then poured around the honeycomb-template sandwich to a depth which allows the liquid cement to extend upward well into the honeycomb cells. This provides cell reinforcement during milling. But the cement is never deep enough to contact the juncture between the honeycomb core material and its superimposed template.

With the electrically heated table operated at approximately 180 F, (not critical), the polyglycol cement remains melted during this pouring operation. As soon as pouring is completed, the tray with its sandwiched and indexed components is transferred to the adjacent cold table. The chill of the 30 to 35 F temperature of this table causes the polyglycol to set and harden very quickly. When the tray is transferred to the cold table, lead weights are placed atop the template before the cement starts to set to hold the honeycomb-template sandwich flat against the bottom of the tray.

After the cement is set, the tray with its indexed components is removed to the milling machine. The tray is indexed on the bed of the machine, then the adhesive tape-mounted template is peeled away from the honeycomb and indexed on the machine's superstructure just above the machine bed. In this position, it serves as a pattern guide for the cutter used to outline-size the honeycomb core. And, of course, the honeycomb core material remains firmly anchored in the indexed tray during subsequent surface milling operations.

After the part is milled, the tray and its contents are taken back to the hot table. The solidified polyglycol cement melts quickly and is poured from the tray into the heated tank at one end of the hot table from which it may be subsequently spigoted and reused. The honeycomb core part is then immersed on a rack in a 3 ft by 12 ft hot water tank operated at approximately 180 F, where any remaining polyglycol cement is melted away. The core material is then ready for bonding into a permanent sandwich.

Construction of both tables is relatively simple. The hot table is topped with a solid sheet of ¾-in. thick aluminum plate in contact with the tubes containing the heating elements. The table is turned "on" in the morning, heats to the desired temperature within a few minutes, and is left on all day so that it is continually ready for use.

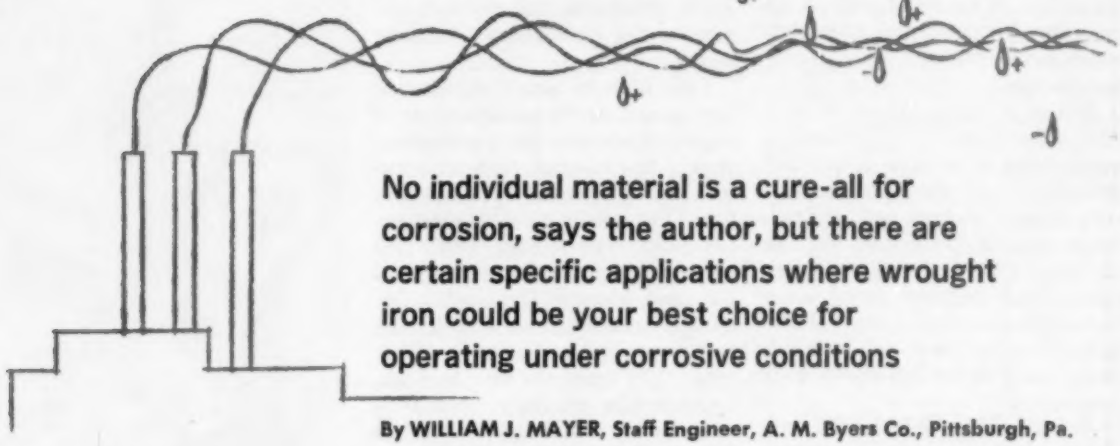
The cold table is topped with a ¼-in. thick aluminum plate, seated on copper coils containing the refrigerant. These coils are backed by a ¾-in. thick plywood sheet which acts as insulation. The refrigerant consists of a very thin, non-viscous oil which is chilled by dry ice and then pumped through the coils. Here again table chill is maintained during working shifts to avoid delay.

The index trays, called "cookie sheets" by Douglas personnel, are merely thin, flat sheets of aluminum of the desired size, edged with ⅜-in. by 1½-in. aluminum bar extrusions laid flat. The precision holes for indexing the honeycomb core templates are drilled in this relatively heavy rim material, after hole locations have been correlated with template mounting positions in the superstructure of the machine.

After a thorough investigation of the numerous techniques used to mount, reinforce, and hold honeycomb material during milling operations, Douglas plant engineers are satisfied that the hot and cold table process, used with indexing trays, is not only the fastest, but involves the least tooling costs.

It might be pointed out that a third type of table is used for the production of one special DC-8 honeycomb cored component. This table is alternately heated by hot water, then cooled by blowing compressed air through the coils. While this table is much slower than the electrically heated and refrigerated tables, it does do the job, and would serve as very economical tooling in a plant where the production of honeycomb cored components was limited. **End**

CORROSION TROUBLES? CAN WROUGHT IRON HELP YOU?



No individual material is a cure-all for corrosion, says the author, but there are certain specific applications where wrought iron could be your best choice for operating under corrosive conditions

By WILLIAM J. MAYER, Staff Engineer, A. M. Byers Co., Pittsburgh, Pa.

CORROSION OCCURS in several ways and in many areas. Perhaps the most familiar areas, or applications, susceptible to chemical or electro-chemical corrosive attack are water lines, steam condensate lines, condenser tubing, and metal stacks.

What is corrosion? How does it occur . . . when does it occur . . . where does it occur . . . and, why does it occur?

To understand the true nature of corrosion, it should be emphasized that moisture must be present for it to proceed. Moisture is an electrolyte. Electrical conductivity of moisture is one factor which determines the pace, or rate, of corrosion. All metals are electro-positive or electro-negative to one another. And, under certain conditions, such as internal stresses, impurities, or non-homogeneity of the mass, differential aeration, etc., set up these electrical conditions on the surface of a single metal.

The effect of natural fresh water acting as an electrolyte in the corrosion cycle can be determined by 1. measuring the amount of dissolved oxygen present, 2. checking its pH value, which indicates whether it is acidic or alkaline, 3. total dissolved solids, and 4. electrical conductivity.

Other than free mineral acid, carbon dioxide and oxygen are the two main corrosive agents found in water. Suspicious evidence of these is indicated by low water hardness—less than 10 ppm, more than 15 ppm of

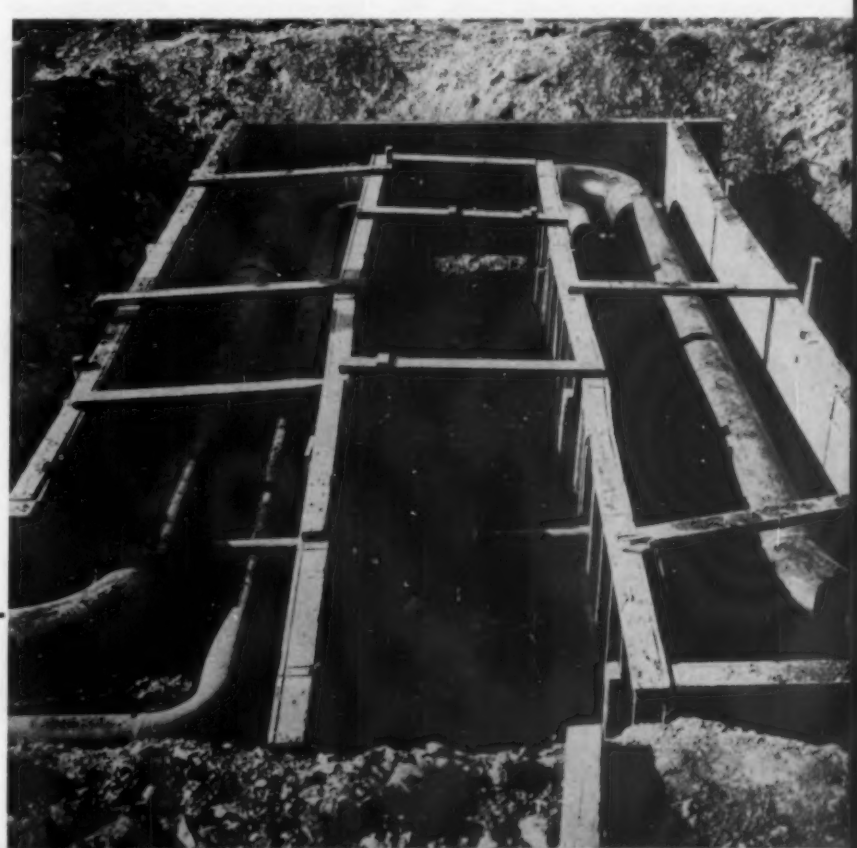


Fig. 1. Entrenched wrought iron condensate line installed in pilot electrical equipment manufacturing plant of IBM Corporation of Lexington, Kentucky.

free carbon dioxide—and the presence of hydrogen sulphide which is natural to some areas.

Water velocity also plays a major role in corrosion. If high enough, this velocity destroys any protective films plated out or precipitated on the surface of the metal, and carries away loosely held corrosion products which might otherwise serve to protect the metal surface.

Typical of these protective corrosion products is oxide coating which forms on wrought iron. When corrosion starts, this surface oxide scale or rust anchors itself through the network of iron silicate fibers in the metal. The scale adheres more tightly than ordinary metal scale. Wrought iron's oxide scale is almost immune to corrosion, and it shields underlying metal against further penetration.

Based on these observations, material selection and proper application are the most important factors in guarding against industrial corrosion.

For Handling Condensate

For instance, in choosing pipe to convey water or steam condensate, the plant engineer should select a metal that will stand up best under the specific application—taking into consideration service life and initial cost, in that order.

Typical of materials that have proved themselves capable of resisting corrosion in a wide variety of industrial applications is wrought iron. This metal is a unique mixture of highly refined iron and iron silicate, containing small quantities of phosphorus, carbon, manganese, sulfur, and silicon.

As an example, wrought iron pipe was installed for gravity condensate return lines at Scotten-Dillon Company, a Detroit, Michigan, tobacco manufacturer, more than 20 years ago. Periodic inspections reveal the lines to be in excellent condition. Other metal in the same service, failed in six months.

In St. Paul, Minnesota, wrought iron pipe and welded fittings were used in a condensate line to convey a tar distillate and chlorine into a run-off tank. The installation, replacing a metal that had failed in six months, has already lasted twice as long.

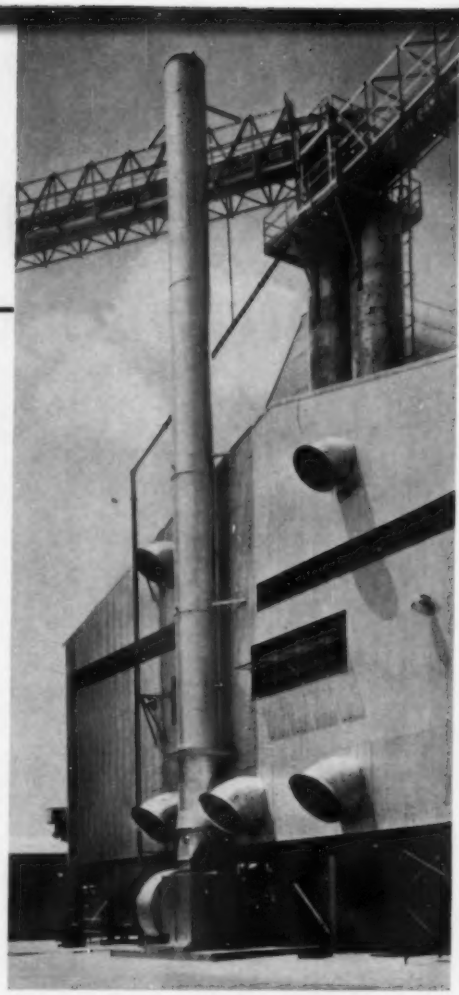


Fig. 2. Stack, 75 ft high, at Owens-Illinois Glass Co., Atlanta, Ga., is fabricated of ¼-in. and 3/16-in. wrought iron plate to guard against failure.

Corrosion in steam condensate lines is one of the boiler operators' biggest headaches. The problem occurs in this manner. At a temperature slightly above 140 F, alkalinity, formed by calcium and/or magnesium bicarbonate, breaks down. This precipitates calcium and/or magnesium, and liberates free carbon dioxide. Available carbon dioxide from this source is bicarbonate alkalinity times 0.79 times per cent makeup, or carbonate alkalinity times 0.34 times per cent makeup. The carbon dioxide, in addition to that entering the boiler system in a free state with the makeup water, is a major corrosive agent.

Acid zeolite or similar treatment of makeup water often eliminates most carbon dioxide before the water arrives at the feedwater heater. Under proper operating and temperature conditions, a deaerating feedwater heater drives off the free carbon dioxide and oxygen. However, some alkalinity does enter the boiler and additional internal treatment is necessary to eliminate residual oxygen and carbon dioxide.

Even with precautions, some oxygen and carbon dioxide can pass over to the process and heating systems with the steam. Where the steam condenses, corrosion conditions exist and the result is pitting and grooving of the metal. Oxygen alone causes pitting usually above the condensate and carbon dioxide attack shows up as grooving.

Oxygen in condensate causes 30 to 40 per cent more corrosion than if carbon dioxide exists alone. A combination of the two accelerates pitting and channeling. Therefore it is important to keep all pump packings and other fittings airtight. Vacuum breakers add to the problem because they admit air into the system.

Even when carbon dioxide is reduced to approximately 3 ppm there is still danger of corrosive attack in condensate lines. When condensate is hot, a considerable portion of carbon dioxide remains in the vapor state above the condensate. In low line areas, not well drained, the condensate cools and becomes highly concentrated with carbon dioxide. It is not unusual for the condensate to pick up several hundred ppm of carbon dioxide in these areas. Therefore, condensate lines should be sloped for drainage.

In general, a safe condensate for low pressure boilers has a pH value of not less than 6.8 and contains not more than 3 ppm carbon dioxide, and not over 0.033 cc per liter of dissolved oxygen.

Differential-metals action may cause deterioration of copper condensate tubes and other ferrous boiler parts. Carbon dioxide and oxygen in condensate dissolve copper and transport it through the boiler system.

From a temperature standpoint, corrosion rate doubles for each ap-

proximate 18-degree increase, which causes greater severity at radiator outlet nipples and adjacent piping. Bucket-type steam traps, rather than thermostatic traps, tend to alleviate this corrosive condition because they retain the condensate longer and give it a chance to cool.

It is readily seen that condensate piping must have the ability to resist this corrosive attack.

Wrought iron is virtually unaffected by refrigeration gases—ammonia, carbon dioxide, and freon, and has a 33 per cent higher thermal conductivity than steel. It has an unusual corrosion-resisting performance record in salt water, heat transfer from brine, and industrial cooling waters—mediums usually associated with tubular condensers and heat exchangers. Wrought iron has also performed well in handling industrial flue gases of tubular air preheaters and in steam generator economizers.

For Tubing

Just how well the metal performs in this service is being shown in a Wisconsin industrial plant. There, three vaporizers produce butane and propane gas. Each unit contains 42 wrought iron tubes, which, since 1942, have had a minimum service life of two years. Steam enters the tubing at 265 F under 10 psi pressure. Petroleum also enters the jacket under pressure, but at prevailing atmospheric temperatures ranging upward from 10 F.

Severe stresses caused by wide temperature variances on interior and exterior tubing cause most failures. In addition to the use of wrought iron, corrosive conditions are alleviated by diffusing cool petroleum over a wider area through use of a replacement baffle between tubes nearest the feed line.

In another application, three heat exchangers were installed with wrought iron tubes in a Detroit, Michigan, processing plant. Each exchanger is 12 ft long and nine feet in diameter. Ammoniated brine concentration—about 10 per cent ammonia and salt, and almost at saturation point—moves through the tubing, entering at 50 to 70 C and leaving at 30 to 40 C. The tubing served eight years before replacement.

Durability records of this kind make wrought iron cold drawn tubing a logical choice for original heat transfer equipment, and give it recognition as a trouble preventer in tubing replacement.

Cold drawn wrought iron tubing is normally installed by expanding the tube ends in the crown sheet. Installation is similar to that employed for steel. However, certain differences do exist and, for best results, should be taken into consideration.

Cold drawn wrought iron tubes sustain an expansion equivalent to approximately 2½ per cent diametral size. Expansion beyond this limit may induce cracking or splitting of the ends.

The correct rolling-in operation stretches metal gradually and uniformly around the entire tube circumference. Tube ends are not flared during or after rolling. For this reason, parallel rollers, rather than flared rollers are used for installation. Specially annealed ends provide maximum ductility. Tubes are ordered to exact lengths, allowing $\frac{1}{16}$ in. and not more than $\frac{1}{8}$ in. overhang at ends.

If Holes Are Oversize

If crown-sheet holes are out of round they must be trued before tube installation. If holes are oversized—when tube and crown sheet hole clearance exceeds 2½ per cent of the tube diameter—total tolerance of tubes should be on the plus side. In excessive cases, use of larger diameter tubes is indicated. Ferrous ferrules also compensate for oversized holes.

Wrought iron tubes are installed with automatic "controlled torque" expanders as well as conventional expanders. When using controlled expanders, maximum joint strength is usually attained when torque control on the expander is set at about one-half the setting for steel tubes of equivalent diameter and gage thickness.

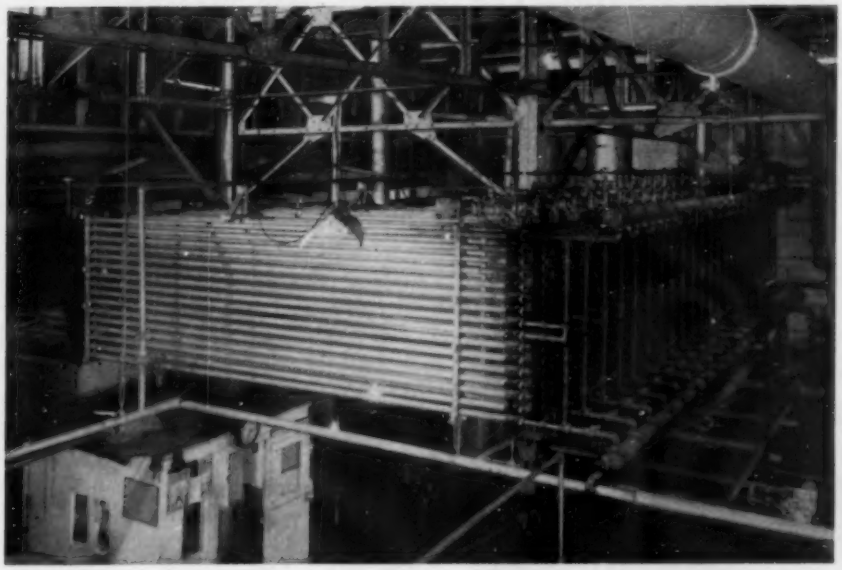
Regardless of the type of tool used, once metal to metal contact with the crown sheet is made, rolling continues only long enough to produce a sound joint. Avoid overrolling. Aside from adverse effects on tube and crown sheet, it serves to weaken rather than strengthen the joint.

Another problem of considerable concern to plant engineers is that of corrosion attack on boiler stacks.

Sulfur compounds, carbon dioxide, and moisture in the furnace gas combine to form a highly corrosive medium, especially when the

(Continued on page 276)

Fig. 3. Wrought iron pipe was used in 23 stand, 16-pipe high off-floor condenser for the ice-making operation. Ammonia gas is fed into the system at 175 psi.



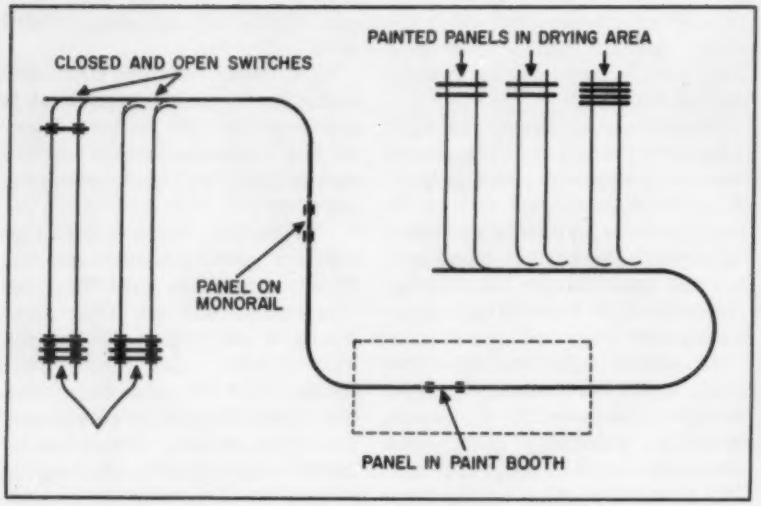


Fig. 1. Diagram of conveyorized painting and drying facilities. Panels stored on trolley for a 24-hour drying period are represented at top right-hand corner.

Fig. 2. Panels are switched to single monorail to pass through paint booth.

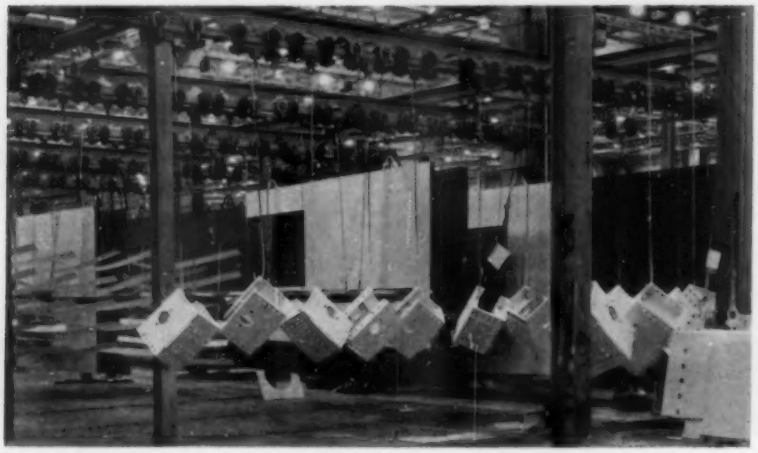
For air drying
CONVEYORS STORE PANELS

By DONALD J. CARR, Plant Engineering Department, Douglas Aircraft Co., Long Beach, Calif.

CONVEYOR STORAGE of large painted panels for a required 24-hour air dry before handling is being accomplished in minimum space at the Long Beach, California Division of Douglas Aircraft Company. The technique involves suspending the panels side-by-side between two overhead monorail conveyor tracks prior to and after painting, then switching the conveyor trolleys onto a single overhead monorail conveyor track for single file progression through the paint booth. See Fig. 1.

The panels being painted are used for Thor missile movable shelters, and are of a sandwiched honeycomb construction about 2½ in. thick. Panel size ranges upward to 8 ft by 16 ft, and panel weight upward to 800 lb. Specifications require a 24-hour air dry after painting and before the panels are handled.

Fig. 3. Drying area where panels are suspended side-by-side from two conveyors.



Storing the panels end-to-end on a monorail track, even though the track was looped to minimize floor space requirements, would have required an excessive footage of expensive, heavy-gage conveyor track. The current installation not only minimizes both track and floor space requirements, but provides convenient storage for the panels both prior to and after painting.

The conveyor trolleys are manually operated. When a stored panel is wanted for painting, it is shoved sidewise along the twin rails to the switches which engage the monorail. The switches are closed and the two trolleys enter upon the monorail. The panel is then pushed endwise past a cleaning station and through a tunnel-type paint booth containing a 10 ft waterfall paint spray booth on either side.

Beyond the paint booth, the trolleys are switched again onto twin rails, and the panel is shoved sidewise into storage position. This final conveyorized drying area is adjacent to the packaging department where the dried panels are palletized for air shipment to remote missile bases. **End**

POWER DISTRIBUTION

MULTIPLE PRIMARY FEEDERS AND NETWORK SYSTEMS

By ROBERT A. ZIMMERMAN
Distribution Engineer,
Westinghouse Electric Corp.,
East Pittsburgh, Pa.

PART II

THE PRIMARY-selective radial system, Fig. 6, differs from those previously described in that it employs at least two primary feeder circuits in each load area. It is designed so that when one primary circuit is out of service, the remaining feeder or feeders have sufficient capacity to carry the total load.

While three or more primary feeders may be used, usually only two feeders are employed. Half of the transformers are normally connected to each of the two feeders. When a fault occurs on one of the primary feeders, only half of the load in the building is dropped. In the systems discussed previously a primary feeder fault causes an outage to all loads in the building.

Double-throw or primary-selector switches are used with all transformers so that when a primary feeder fault occurs, the transformers normally supplied from the faulted feeder can be switched to the good feeder and restore service to all loads.

The short-circuit duty on the load circuit breakers is less than in the banked-secondary radial system, and is about the same as for all other types of radial systems using transformers within the load areas.

If a fault occurs in one transformer, the associated primary feeder breaker opens and interrupts service to half the load in the building, just as when a primary feeder fails. The faulted transformer is disconnected by moving its primary-selector switch to the open position. Service is then restored to all loads except those normally supplied by the defective transformer by closing the primary feeder breaker.

Service cannot be restored to the loads normally served by the faulted transformer until the transformer is repaired or replaced.

Cost of the primary-selective radial system is greater than that of the simple radial system, Fig. 2, because of the additional primary feeder breaker, the use of primary-selector switches, and the greater amount of primary feeder cable required. The benefits derived from the reduction in the amount of load dropped when a primary feeder or transformer fault occurs, plus the quick restoration of service to all or most of the loads, may more than offset the greater cost.

The primary-selective radial system, however, is not as good as the banked-secondary radial system from the standpoint of restoring service to the loads after a primary feeder or transformer fault. It is only a little better than the loop-primary radial system in this respect.

In some cases, particularly in fairly large plants with medium or light-load density, about the same quality of service can be rendered at less cost by using the loop-primary radial system employing two separate loops instead of one. In this case, half of the transformers are connected to each loop of the system.

The secondary-selective radial system uses the same principle of duplicate feed from the power supply point as the primary-selective radial system. In this system, however, the duplication is carried all the way to each load bus on the secondary side of the transformers instead of just to the primary terminals of the transformers. This arrangement permits quick restora-

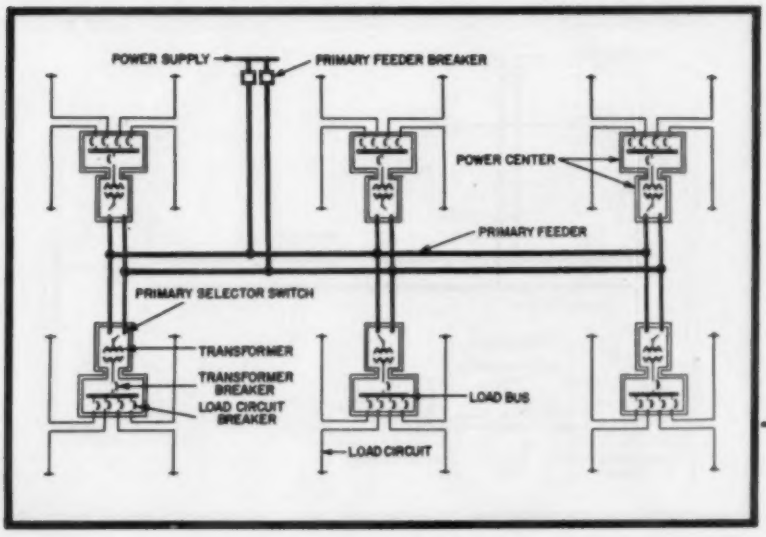


Fig. 6. Primary-selective radial system employs at least two primary feeder circuits to each transformer substation.

tion of service to all loads when a primary feeder or transformer fault occurs, as does the banked-secondary radial system.

The usual form of secondary-selective radial system is shown in Fig. 7. Each load area in the building is supplied over two primary feeders and through two transformers. The capacity of each of these transformers must be such that it can safely carry the entire load in the area served by both transformers. Each transformer is connected through a transformer breaker to a secondary bus section to which half of the radial load circuits are connected.

A bus-tie breaker is provided for connecting the two secondary or load bus sections at each load center. Normally this bus-tie breaker is open and the system operates as two parallel systems entirely independent of each other beyond the power supply points.

The bus-tie breaker is interlocked with the two transformer breakers so that it cannot be closed unless one of the transformer breakers is open. This is done to keep the interrupting duty imposed on the load circuit breakers to a minimum.

A primary feeder fault causes half of the load in the building to be dropped, as with the primary-selective radial system. Service can be restored by opening the transformer breakers associated with the faulted feeder and closing all bus-tie breakers.

When this is done, the entire load is fed over one primary feeder and through half of the transformers. Therefore, both primary feeders must be capable of carrying the entire load, as with the primary-selective radial system, and much more transformer capacity is required.

A fault in a transformer causes the associated primary feeder breaker to trip and interrupts service to half the building load. Service can be restored by opening the disconnecting switch on the primary and the circuit breaker on the secondary of the faulted transformer, closing the associated bus-tie breaker, and reclosing the primary feeder breaker. This manual switching restores the system to normal operating conditions except that the faulted transformer is de-energized and its load is being supplied through the adjacent transformer.

From the standpoint of voltage fluctuation when a load such as a relatively large motor is thrown on the system, this system is not as good as the banked-secondary radial system. The advantage that the secondary-selective radial system offers over the banked-secondary radial system is that a primary feeder or transformer fault causes only one-half the load to be dropped instead of all the load in the area. Both systems permit the quick restoration of service to all loads when a primary feeder or transformer fault occurs.

The banked-secondary radial system has more flexibility and can be more readily adapted to changing load conditions than can the secondary-selective radial system.

A modified form of secondary-selective radial system that will often be less costly than the common form previously described is shown in Fig. 8. In this system there is only one transformer at each load center, instead of two. Pairs of adjacent load buses are connected by secondary cables or bus duct capable of carrying the entire load of either bus. This is done to permit picking up the load of any bus when a primary feeder or transformer fault occurs.

Each tie circuit is connected to

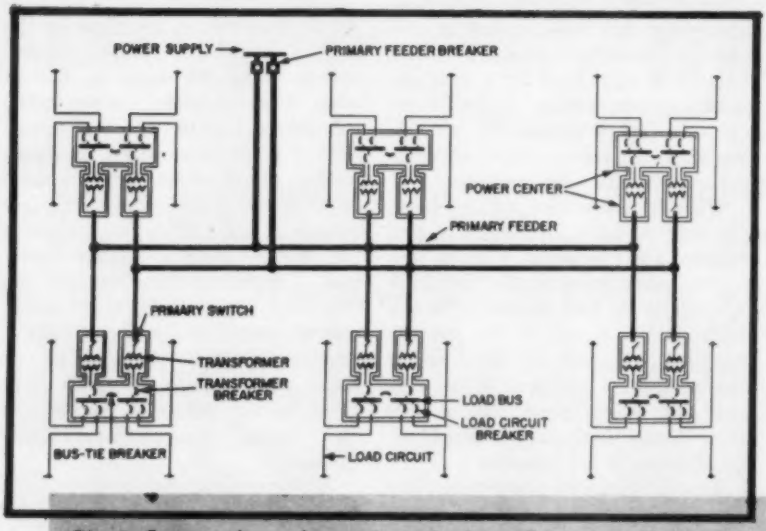
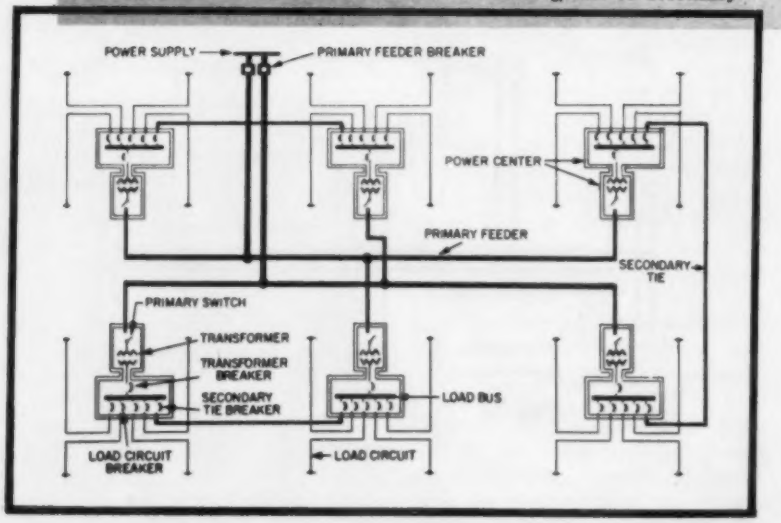


Fig. 7. Common form of secondary-selective radial system. Each load area is supplied over two primary feeders and through two transformers.

Fig. 8. Form of secondary-selective system using one transformer at each load center. Adjacent load centers are tied together on secondary



each of its two load buses through a secondary-tie circuit breaker. Each secondary-tie breaker is interlocked so that it cannot be closed unless one of the two transformer breakers is open.

There are two ways in which this single-transformer-substation form of secondary-selective radial system can be handled. One is to use the same number and rating of transformers as in the usual form of the system. Essentially, this results in twice as many load areas with half as much load in each area.

Advantages of First System

This arrangement has the advantage of reducing the average length of the radial load circuits and thereby reduces the cost of the secondary conductors. When compared with the other types of distribution systems, both this and the usual form of secondary-selective radial system introduce the problem of balancing the loads on twice the usual number of load buses.

The a-c secondary network system is the system that has been used for many years to distribute electric power in the high-density, downtown areas of cities. The advantages of this type of system have led to modifications that make it applicable to serve loads within industrial plants.

The best known advantage of the secondary network system is continuity of service. No single fault anywhere on the system will interrupt service to more than a small part of the system load. Most faults will be automatically cleared without interrupting service to any load. Another outstanding advantage that the network system offers is its flexibility to meet changing and growing load conditions at minimum cost and with minimum interruption of service to the other loads.

In addition to flexibility and service reliability, the secondary network system possesses a number of other important advantages. It provides exceptionally uniform and good voltage regulation, and its high efficiency materially reduces the cost of losses. These advantages mean that the secondary network system provides the highest quality of service with a minimum of operating and maintenance expense.

Physically the simple network system differs from the simple radial system in three major points which account for its outstanding advantages. First, a network protector is connected in the secondary leads of each network transformer, Fig. 9, in place of the usual transformer secondary breaker. Second, the secondaries of all transformers are connected together by a ring bus or secondary loop from which the loads are supplied over short radial circuits. Third, the primary supply has sufficient capacity to carry the entire plant load without overloading when any one primary feeder is out of service.

A network protector is a specially designed, motor-closed and shunt-tripped, air circuit breaker controlled by network relays. The network relays function to automatically close the breaker only when voltage conditions are such that its associated transformer will supply load to the secondary loop, and to automatically open the breaker when power flows from the secondary loop to the network transformers. The purpose of the network protector is to protect the secondary loop and the loads served from it against transformer and primary feeder faults by disconnecting the defective feeder-transformer unit from the loop when a back-feed occurs.

Reason for Secondary Loop

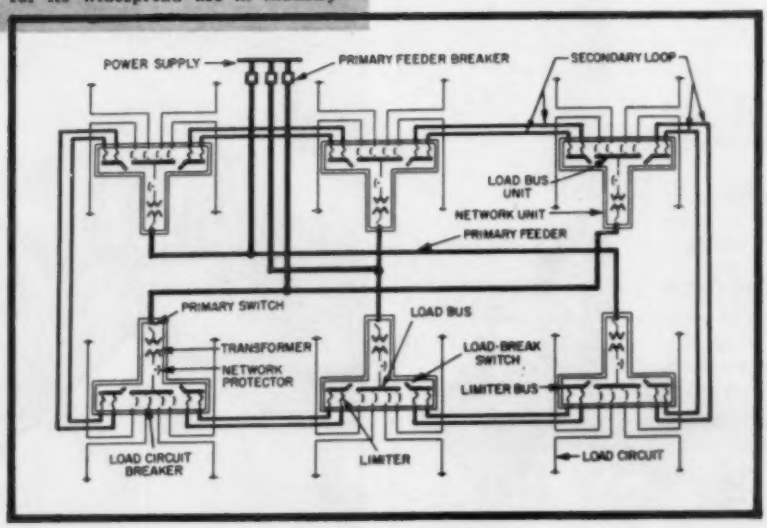
The chief purpose of the secondary loop is to provide an alternate supply to any load bus when the primary feeder which normally supplies it is de-energized, so as to prevent any service interruption when a transformer or feeder fault occurs. The use of the loop, however, gives at least four other important advantages.

It permits lightly loaded transformers to help those which are more heavily loaded and thus tends to equalize the load on all transformers. The secondary loop makes it unnecessary to match the load supplied from any one load bus with the transformer capacity available at the point. Loads can be served from the loop at load buses located between network transformers and the load circuits can be run directly to loads from nearest load bus.

This permits the use of very short radial load circuits and results in a considerable saving in secondary cable and conduit when compared with the load circuits of a simple radial system.

The voltage regulation on a network system is such that both lights and power can be fed from the same load bus. Much larger motors can be started across the line than on a simple radial system. This often results in greatly simplified motor control and permits the use of large low-voltage motors with less expensive control. **End Part II**

Fig. 9. Network system differs from radial in three ways which accounts for its widespread use in industry



IMPORTANT TIPS ON SELECTING FILTER MEDIA

1. Understand the requirements
2. Consider operating conditions
3. Engineer the filter housing
4. Check all available filter media
5. Know the degree of filtration

By H. C. MOUWEN, Manager, Research and Development, Purolator Products, Inc.

OPERATING CONDITIONS of today's industrial processes are too severe for the application of yesterday's filter media. These conditions include—among other important factors—elevated temperature, elevated pressure, corrosive atmospheres, shock resistance, and more stringent degrees of filtration.

There was a time when cotton or cellulosic media could satisfactorily meet almost all the conditions. Although these latter materials are still very important, they cannot remove activated alumina dust from an air stream at 750 F, nor filter solid CO_2 particles out of liquid oxygen.

In order to meet increasingly complex industrial requirements, new filter media are developed every day. Practically every known porous structure is investigated for its ability to serve as a filtration or separation stage. Many such investigations result in a new filter material for a special application but, in most cases, research and development laboratories are faced with the job of tailor-making a new filter medium for particular conditions.

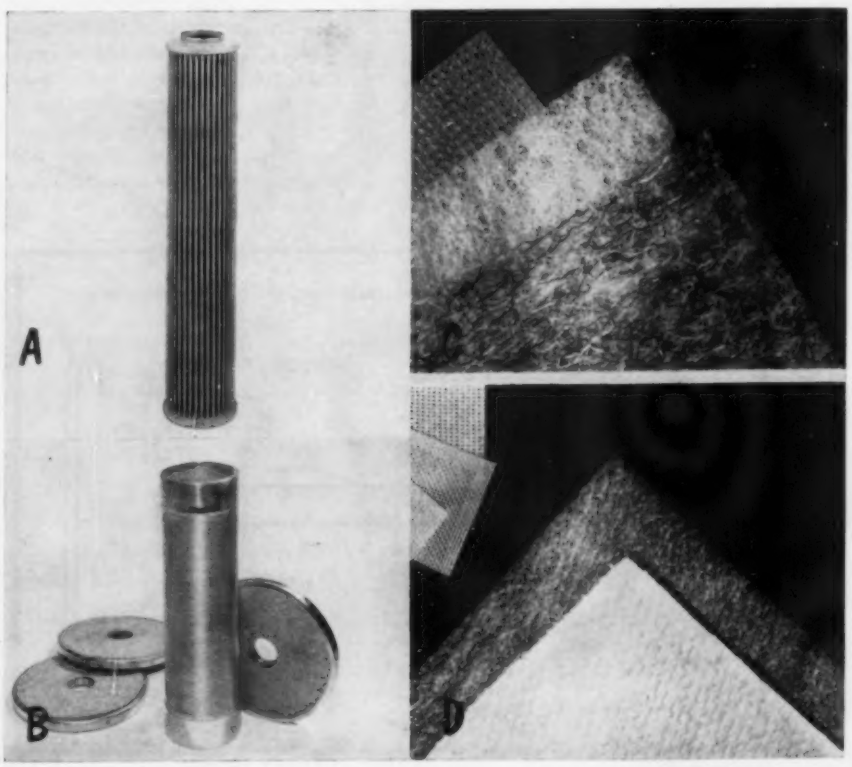
Understand the Requirements—Filtration requirements today have one thing in common—they are all different. At present for example, most industrial filters are meeting temperature requirements ranging from —420 F to 1200 F, pressures from nearly perfect vacuums to 10,000 psi, degrees of filtration from submicronic (<1 micron) to over 500 microns.

Requirements like these are the result of technological advances in the chemical process industry as well as many other allied industries (atomic, aviation, petrochemicals, etc.) where new engineering developments are being made.

Liquid oxygen plants, uranium process plants, nuclear reactors, jet aircraft, nuclear powered ships and submarines, plastic manufacturing plants, catalytic reactors, and food processing operations all play an important role in the development of new filter media.

Liquid oxygen, for example, has imposed some exacting demands on filter media since it must be filtered before end use. Water, dirt, and CO_2 are generally the more important contaminants removed by filters. The filtration is performed at approximately —300 F where the oxygen is liquid and flows through the pipeline as easily as water.

To meet these requirements, cellulose and glass filter media were initially used to filter liquid oxygen,

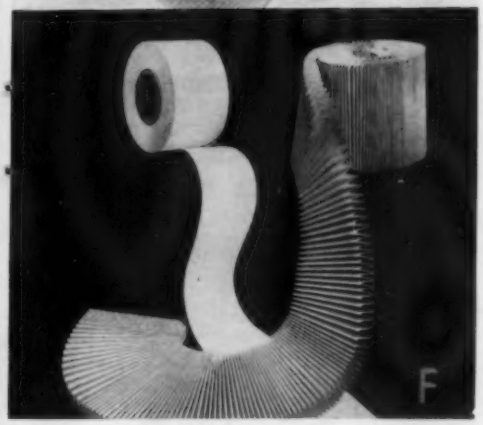


and the results were fair if no shock occurred during filtration. Shock, however, destroyed these media since they are extremely brittle at —300 F.

What next? Woven wire screen (stainless steel) worked perfectly and possessed sufficient strength, but most requirements specified 10 micron filtration and standard wire screens available provided only about 38 micron filtration. Continuous investigation showed porous metal, produced from stainless steel powder, had sufficient flexibility in the manufacturing process to range from about 40 microns to submicronic pores. Hence, porous metal was used and met all the requirements of liquid oxygen filtration successfully.

Consider Operating Conditions—Present day aircraft hydraulic sys-

Below: Illustrations show several types of filter media which can be employed for specific filtering jobs. They are identified as follows: A, porous metal convoluted filter element; B, porous metal, fibrous and metal edge products; C, woven and non-woven plastic filter media; D, woven and non-woven glass filter media; E, woven wire mesh filter media; F, resin-impregnated cellulose filter media.



GENERAL CHARACTERISTICS OF FILTER MEDIA

1. Impregnated cellulosic materials
   - Temperature: —65 to 275 F (continuous operation) 300 F (intermittent operation)
   - Pressure: 10,000 psi (system pressure) 150 psi (differential pressure)
   - Degree of Filtration: Average 2 microns to 40 microns

   Remarks: Used for many purposes—hydraulic fluids, lubricating oils, fuels, solvents, air, gases and water.

2. Woven and non-woven glass fiber materials
   - Temperature 0 to 800 F (continuous operation)
   - Pressure: 10,000 psi (system pressure)
   - Degree of Filtration: Average 5 microns to 500 microns

   Remarks: Used for higher temperature applications, generally gas systems. Also used for water and solvent filtration. Important as air filter media.

3. Woven and non-woven plastic fiber materials
   - Temperature: —65 to 450 F (continuous operation and dependent on type of plastic)
   - Pressure: 10,000 psi (system pressure)
   - Degree of Filtration: Average 5 microns to 500 microns

   Remarks: Used for corrosion resistance, and other special purposes; air filter media; also used as water filter media.

4. Woven wire screen
   - Temperature: —420 to 1200 F
   - Pressure: 10,000 psi (system pressure) 4500 psi (differential pressure)
   - Degree of Filtration: Average submicronic to 500 microns

   Remarks: Used for high temperature, corrosion resistance, shock resistance, hydraulic fluids, lubricating oil, fuels, gases, water, acid and alkali solutions, solvents, etc.

5. Porous metal, continuous metal edge
   - Temperature: —420 to 1200 F
   - Pressure: 10,000 psi (system pressure) 3000 psi (differential pressure)
   - Degree of Filtration: Average 40 microns to 500 microns

   Remarks: Used for high temperature, corrosion resistance, shock resistance, heavy duty, all types of fluids including food processing, industrial processing, etc.

6. Porous metal, powder metallurgy
   - Temperature: —420 to 1200 F
   - Pressure: 10,000 psi (system pressure) 3000 psi (differential pressure)
   - Degree of Filtration: Average—submicronic (1 micron to 40 microns)

   Remarks: Used for high temperature corrosion resistance, shock resistance, all types of fluids including corrosive gases; molten sodium; high temperature gases, liquid oxygen, etc.

7. Porous metal, fiber metallurgy
   - Temperature: —420 to 1200 F (continuous operation)
   - Pressure: 10,000 psi (system pressure)
     3000 psi (differential pressure)
   - Degree of Filtration: Average 4 microns to 60 microns

   Remarks: Used for high temperature, corrosion resistance, shock resistance; all types of fluid including corrosive gases, molten sodium high temperature gases, liquid oxygen, as well as chemical process applications.

SELECTING FILTER MEDIA

tems require rather specific degrees of filtration. In order to provide a hydraulic fluid which is free of damaging dirt particles, the average pore size of the filter medium may have to be five microns with the special requirement that the largest pore cannot be larger than 25 microns.

Special Design Necessary

This means a precision medium; one which is manufactured and laboratory tested under constant vigilance. There can be no doubt in anyone's mind about the dependability and efficiency of a filter for an aircraft hydraulic system.

For such applications, a specially woven, stainless steel wire cloth—or cellulosic paper medium, depending on temperature—is used to meet some of the most exacting specifications. These materials are tested and re-tested to confirm their ability to fulfill the requirements.

In filtration, any medium—porous metal, porous ceramics, felt matting, paper, etc.—can filter out particles down below five microns after a contaminant layer has built up on the surface of the medium. In this case, the cake or layer of dirt is performing the filtration and the medium acts as a support.

However, rigid requirements, such as found in aircraft hydraulic systems, include specifications for "first pass" performance. That is, the filter medium characteristics are determined *before* the contaminant layer has had a chance to cause effects. Of course, the decision for rigid specifications is relatively easy for hydraulic systems but many other operations must be carefully analyzed before the engineer can state the filtration requirements.

If a medium will perform with an efficiency of 99.5 per cent on iron oxide dust and only three or four particles of 30 to 40 microns pass through to account for the 0.5 per cent lost, will operation be effected? A hydraulic system might; a dust collector for product recovery would not; and a feed line to a pump with moving part clearances of 0.004 in. would not.

Specific rigid requirements mean increased filter media costs. This is only reasonable so why pay money for non-essential requirements? Materials are costly and over-specifying filter requirements may increase the difficulty of operations.

Most operating conditions cannot be changed to meet filter media characteristics. If hydrogen floride gas is the reactant or if fluorine gas is the product and they must be filtered, then that is the problem. There are some processes where components can be filtered up stream or on the feed side of the system where they are less reactive. This cleanup point may eliminate further filtration downstream.

Chlorine gas in the bone dry state is not difficult to filter and materials are easily chosen to withstand the conditions. A wet chlorine gas is another problem and one which requires a different solution.

Unusual Application

In uranium processing, high temperatures and corrosive conditions are encountered. One system included the use of vibration or shock equipment to prevent cake buildup on the filter medium. The medium was porous metal and various installations had been used to accomplish the filtration operation.

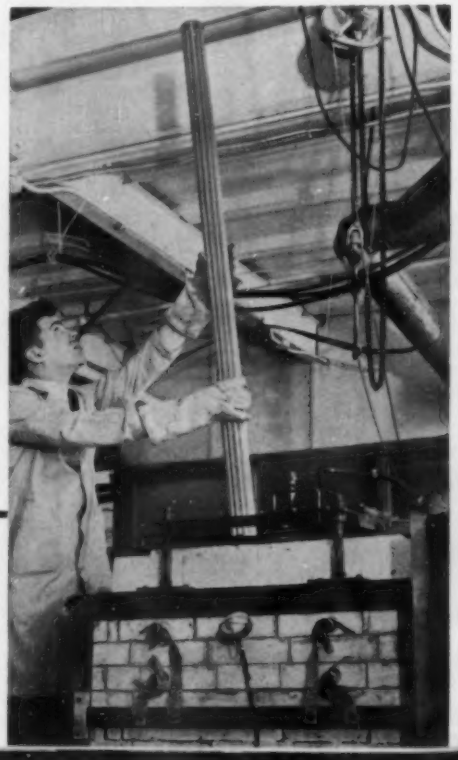
There were many conditions to consider: temperature, corrosion, thermal expansion, shock resistance (medium strength and support structure) and finally, degree of filtration. All these requirements were considered and designed into a simple filter medium. Simple, because of its compactness and design. The filter was installed and the results were excellent. It has been in operation for months whereas previous filters only lasted a few weeks.

Engineer Filter Housing—Good filter housing design is extremely important. In many cases, it's more important than the filter medium. As mentioned above, the engineer finally faces the problem of what to put the filter in. The word housing sounds simple and easy but remember, it also must withstand the same conditions that the filter medium withstands.

In most cases it must be a code design and specific attention must be given to the functional characteristics. It must open easily without disrupting line connections; it has to be drained; it has to be vented; it has to be cleaned; and it must be tested.

A typical case history is the following. A high pressure system required a strainer to remove all dirt particles over 60 microns. The system pressure was 3000 psi and the hydrostatic test pressure was 4500 psi. The unit was to be as small as possible and as light as possible. A code design was required.

The initial design had a bolted flange closure for a compact body with inlet and outlet nozzles. This design weighed 45 lb and was about eight inches in body diameter. The final design has a threaded cap with drain plug on the same compact body and weighs only 14 lb and is about four inches in body diameter. The operational characteristics are exactly the same but good engineering design provided a difference: The strainer can be mounted easily and simply; it can be serviced with a minimum of effort; and a lighter unit proved to have many other advantages.



Porous fused metal filter, similar to those which are designed for nuclear reactor and missile applications, is inspected in furnace room at laboratory.

Superintendent at Sowerbutt Quarries, Inc., inspects dust accumulation and filter on turbine oil reservoir for rock crushers. The air filter was adapted to original breather fittings and has saved the company 450 gallons of oil annually.

Filter Media Characteristics—The development of filter media includes a very wide range of materials. Each one has particular properties or characteristics which are important in its application. There is a limitation for each and every filtration media. Many times, these limitations are lifted by means of design considerations. A material with poor strength can be mechanically supported to withstand high differential pressures. A standard resin impregnation in a cellulosic material can be increased to provide stability.

The following materials enable us to meet the wide range of operating conditions previously mentioned:

1. Impregnated cellulosic materials
2. Woven and non-woven glass fiber materials
3. Woven and non-woven plastic fiber materials
4. Woven wire screen
5. Porous metal, continuous metal edge
6. Porous metal, powder metallurgy
7. Porous metal, fiber metallurgy

From the above, it is possible to select a material to meet any given specification. The general characteristics for each material are listed in the box on the second page for use as a guide in such a selection.

The uses of many of these filter media seem to overlap or duplicate one another. This is correct but there are specific reasons for this. Powder metallurgy enables the filter media to be produced in certain shapes and sizes which cannot be done by fiber metallurgy. This latter process lends itself very nicely to the production of flat sheets and discs. Woven wire screen can be convoluted very close together and provide large area in comparatively small volumes. Each medium has particular characteristics from a production standpoint as well as from an application standpoint.

Degree of Filtration—Finally, this discussion would not be complete without a few words on pore size. Two important properties usually classify a filter media with respect to its filtering ability. These are: (1) the absolute pore size rating, and (2) the average pore size rating.

The absolute rating is defined as the maximum pore opening and the average rating is some average pore size of a media which meets specific particle removal requirements. The average pore size is usually based

(Continued on page 279)

Table shows results of tests conducted on three types of filter media, using bubble, glass bead and dust test methods.

FILTER MEDIA	APPLICATION	PORE SIZE RATING	BUBBLE TEST	GLASS BEAD TEST	DUST TEST
Woven Wire Mesh (SS)	Hydraulic System Filter	Absolute	25 microns	22 microns	
		Average	16 "	10 "	
		Actual Performance		Note (1)	
Porous Metal (Monel)	Gas Filter— Chemical Process	Absolute	94 "		42 micron
		Average	14 "		Note (2)
		Actual Performance			Note (2)
Resin Impregnated Cellulose	Air Filter— Lox Plant Process	Absolute	40 "		29 micron
		Average	10 "		Note (3)
		Actual Performance			Note (3)

Note (1) 96 per cent by weight removal of spherical glass beads, specification beads range 10 to 20 microns
Note (2) 99.+ per cent by weight removal of Arizona dust, specification 0 to 5 microns 39 per cent; 5 to 10 microns 18 per cent; 10 to 20 microns 16 per cent; 20 to 40 microns 18 per cent; and 40 to 80 microns 9 per cent
Note (3) 98.5 per cent by weight removal of Arizona fine dust (same specifications as above)

How To Get The Most From YOUR COMPRESSED AIR SYSTEM

By EARL B. HAMILTON, Chief Engineer, Buckeye Tools Corp., Dayton, Ohio

"JOE, THIS NEW air tool just hasn't got any guts!"

"Did you check the screen?"

"Sure. It's clean."

"Then, you'd better get the foreman over here so he can make a pressure test at the handle."

"What good does that do?"

"Well, if the pressure's OK before the tool's turned on but drops when you flip the valve, chances are we've got some trouble upstream on the air line."

THE "IF" IN THIS hypothetical conversation relates definitely to the duties of the plant engineer, for when the trouble is "upstream", the plant's compressed air distribution system requires evaluation. Incidentally, the sketch, Fig. 1. indicates the method followed to make a pressure test at the tool handle.

Briefly, the system involves the compressor and its controls, the pipe network and its reservoirs, the work station, and the tool itself. Data presented in this article should help in the evaluation procedure.

Compressor and Controls

In some cases, inadequate air pressure can be traced directly to the compressor. The fastest way to check this is to call in a compressor specialist, but if you're a do-it-yourself type you can start by making a list of all plant equipment using air (blow guns, air chucks and gages, spray painting, pumps, hoists, pneumatic tubes, air tools, etc.), noting the maximum air consumption of each device, then estimating, to the best of your ability, what the use factor is. Our experience has been 50 per cent on tools, and you can probably use the 50 per cent factor on other equipment where there is considerable doubt.

After you have applied the use factor to the maximum consumption figures and added all the individual items to obtain an estimated use total, then you have a rough approximation of your total air requirements.

If you do not know the output of your compressor, look on the nameplate of the electric motor for its rated horsepower. Multiply the horsepower by 4 and you will have the approximate total cfm (at 100 psi) put out by that compressor. For example, a compressor driven by a 40 hp motor will deliver 40 by 4 or 160 cfm at 100 psi.

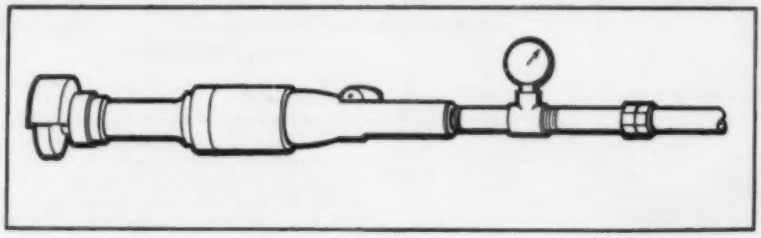
In our compressor room, Fig. 2, we have a 40 hp compressor that delivers 166 cfm at 100 psi, cooled by water—to give it stamina for all-day operation—but we are contemplating adding another compressor to bring out total to 400 cfm. We also have tied into the system a 7½ hp compressor that operates blow guns only under special production situations, such as overtime by a single department.

Since compressors are normally located in remote spots, we suggest the following three controls: (1) modulating water control valve to maintain constant cooling water temperature; (2) pressure control on the oil feed system serving compressor's working parts to shut off motor when oil pressure drops; and (3) a thermocouple heat indicator to turn off the motor if cooling water in the compressor head gets too hot.

Whenever compressed air becomes "working" air—not just transferred, as in the case of flowing through a pipeline—its temperature drops as horsepower is developed. This causes moisture to condense, and moisture can mean rust. For this reason, an aftercooler is recommended. Water enters our aftercooler at 55 F and leaves at 62 F, but it has meanwhile cooled the temperature of the air down to 78 F. The bulk of the moisture is therefore pulled out of the air at this spot and is drained regularly. Without an aftercooler, every line in the plant will have to be drained individually and often.

Since air flows from high to low pressure areas, the most efficient pipe system, Fig. 3, is a loop. This

Fig. 1. If tool performance is not satisfactory, the first check should always be a pressure test at the tool handle. It can be done with the equipment shown.



Three factors affecting compressed air efficiency: compressor and controls, piping and work station. They must be well designed and maintained to eliminate power losses to tools and other equipment

should give equal pressure at all work stations, whereas a U-shaped system could cause considerable variation. A small investment to complete the loop would be well worthwhile.

Our spot checks of various plants reveal that a large percentage of the air problems originate in the piping. Many firms are content with a *static pressure* of 90-100 psi, but the important matter is *pressure under flow conditions*, and that requires:

1. Pipe diameter of ample size to accommodate anticipated air demand. As in the case of liquids, air moving through a pipe encounters friction, and the loss of pressure through friction can be considerable. Table I shows pressure drops in 500 ft of various sizes of piping. For this reason, if you are planning to improve your piping system or install a new one, we suggest you purchase pipe of a larger diameter than that called for by your present needs. In a 500-ft-long system, the difference between 1 in. and 2 in. pipe would amount to less than $150, and this is small compared to the labor charge.

Example: If a 150 cfm compressor delivers its output at 100 psi to one end of a 500 ft length of 1-in. pipe, only 68 psi will be measured at the other end; with 2-in. pipe, the drop is less than one pound. If the compressor delivered 500 cfm instead of 150, 1-in. pipe would not be at all satisfactory; 2-in. pipe would cause a drop of ten pounds; with 3-in. pipe, drop would be one pound.

This example approximates our own conditions, as noted several paragraphs above. Fortunately we installed a 3-in. main pipeline to begin with, and the additional compressor output will not trouble our present system.

It should be noted that under certain circumstances a pressure drop of 10 lb will result in a 27 per cent decrease in tool efficiency. The tool is the "business end" of your system. No matter what the pressure drop, efficiency drops faster, and air tools depend on 90 psi at the handle (under flow conditions) for optimum operation.

2. Air delivered to tool in top condition (clean and dry). Piping should never be installed perfectly level. There should always be a tilt to a series of traps along the main line through which water can be removed. Air take-offs from the main line always should come from the *top* of the line to avoid water intake. Clean air is devoid of rust, metal chips, sand, dirt, and any other substance that could cause abrasion or corrosion. In regard to piping: we would favor galvanized over black iron in sizes under 2 in. simply because it is easier to maintain in a clean, rust-free condition.

Of course, galvanized has its problems, too, and our preference for it is not blind. In most cases, your choice of pipe connection will influence the type chosen, for black iron is best for welded lines and galvanized is best for threaded lines. And then there's the matter of comparative costs, installation versus maintenance.

We further recommend that original construction take-offs from the main line be at a maximum spacing of approximately every 20 ft, the standard pipe length. Ours vary from 8 to 20 ft apart. At every spot where the pipe had to be cut for installation we put in a take-off, for it is a lot easier to cap an unused take-off than it is to cut in new ones if plant layout should ever change.

Another comparatively inex-

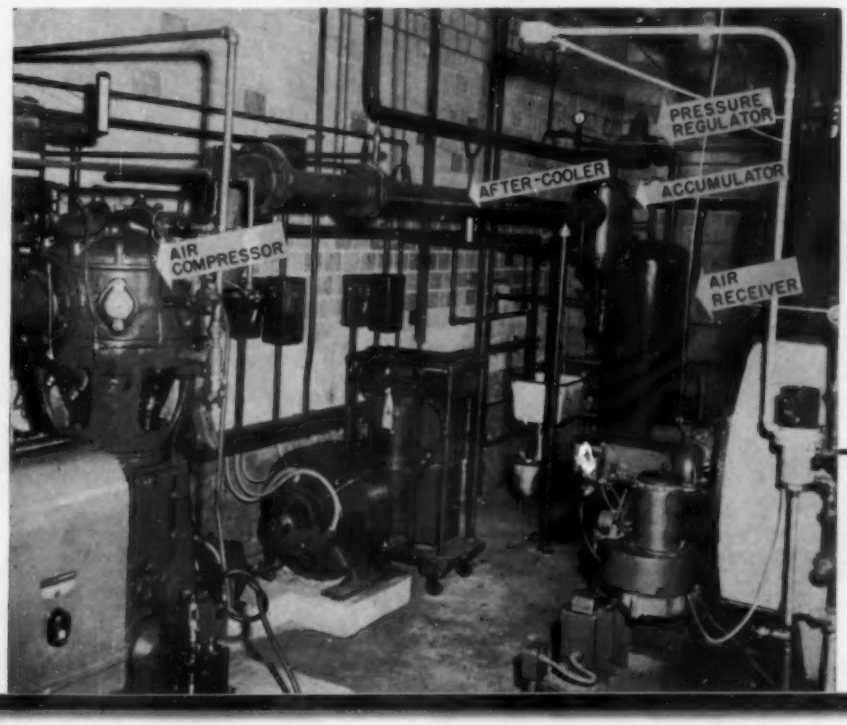


Fig. 2. Compressor room at author's plant. All items shown should be considered essential to optimum operation. Automatic safety controls are the best.

COMPRESSED AIR

pensive insurance move is the installation of an accumulator tank at that point in the system most remote from the compressor. Compressed air may be stored here until demand, and this will prevent starvation of those work stations farthest from the compressor.

Naturally, the pipe itself serves as a type of reservoir. The larger the pipe diameter, the more air can be stored in it.

Work Station: Trouble Spot

The work station, Fig. 4, is perhaps the most frequent trouble spot for air problems. Its chief offenses are:

a. poor arrangement of hose and tools
b. wrong hose size or inefficient coupling
c. poor housekeeping

Keeping in mind the value of clean, dry air, it is important that the flexible hose be attached to the side take-off, which is at least 6 in. above the bottom of the down drop. This 6-in. trap will collect whatever moisture may accumulate in the take-off (along with other undesirable solids), and the liquid may be drained off periodically by a blow-off valve.

Particularly where tools are concerned, we recommend the installation of a filter and oiler between the take-off and the flexible hose. This is the best place for it, since it is normally close to the tool and may be firmly attached to the wall or pillar. The filter helps to remove particles that may have passed previous traps. The fog-type oiler lubricates the tool and acts as a rust inhibitor. Oilers are not necessary for blow guns and are out of the question for paint sprayers, but they are of great assistance to other air-powered equipment.

There is no universal hose diameter for all air equipment, nor is there any universal diameter for all air tools. The recommended hose size is always stamped on the identification plate, and these recommendations should be followed carefully for optimum performance.

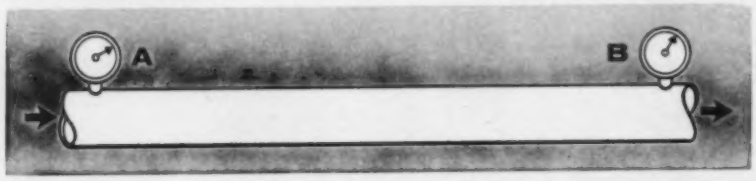
Our experience has been that light, thin-walled, highly flexible hose specially designed for air tools works best and that it should not exceed a maximum length of 25 ft to avoid a serious pressure drop. Where extra range is needed occasionally, a "whip" can be employed; this would consist of a length of larger diameter hose coupled between the pipe fitting and the recommended diameter hose and would permit flexibility and range with a minimum of pressure drop.

Seldom is an adequate amount of thought given to the choice of couplings between the hose and the tool. There are three types—quick change couplings, barbs, and pipe nipples—in common use, and we feel quite strongly that careful selection should be made to assure minimum pressure drop through the fittings.

The importance of proper hose diameter and fittings is graphically shown in Table II. Quick-change couplings and barbs sometimes restrict flow enough to lower tool efficiency when the other portions of the system are perfect; old couplings are often worn enough on their own to reduce performance.

Carelessness at the work station can cause a variety of problems. For example, when a grinding wheel is turned off the momentum of the spinning wheel will cause the tool to coast briefly before coming to a stop. If it is placed on a table with the wheel spinning, the wheel will gouge the table, possibly wear a

Table I. With gage pressure at 100 psi and with pipe sizes from 1 in. up to 3 in. this table shows the pressure drop that can take place in 500 ft of clean pipe.



Pipe	Gage Pressure at A, psi	Gage Pressure at B at 150 cfm	Gage Pressure at B at 500 cfm
1	100	68	—
1¼	100	92	—
1½	100	94	64
2	100	99.3	90
3	100	99.9	99

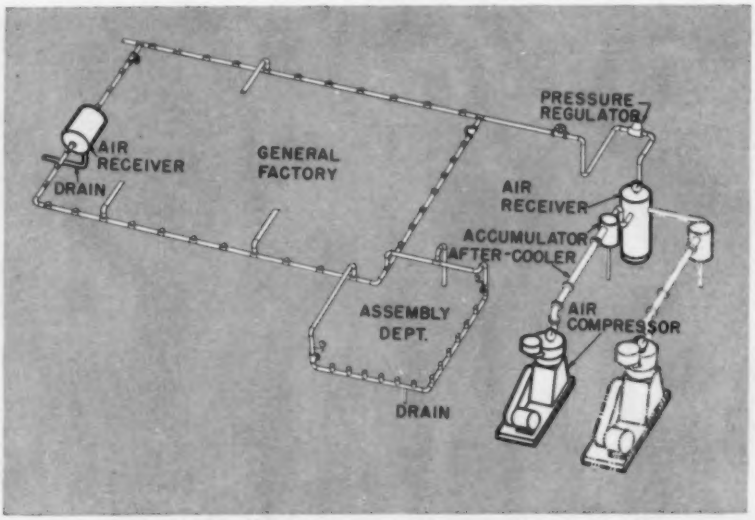


Fig. 3. This is a sketch of the author's own air distribution system; it illustrates the loop principle. The assembly department in the plant also has a loop system.

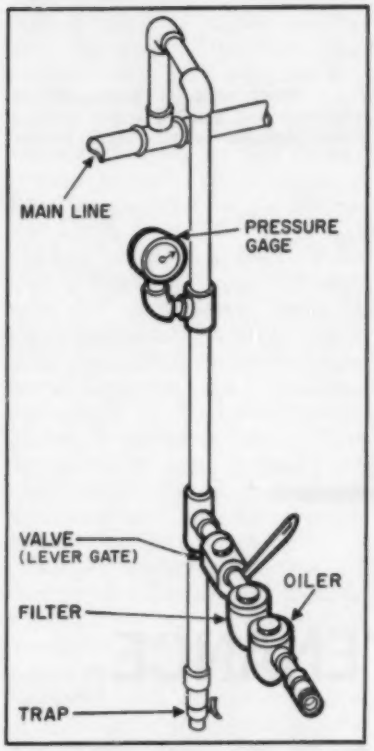


Fig. 4. Work station, pictured here, is one spot that offers the greatest possibility for trouble, says the author.

hole in the hose, and could cause some internal stresses contributing to tool damage. In this specific case, and in others of similar circumstances, we recommend a balancer or tension device from which the tool can be hung. In cases where the weight of the tool does not help to get the job done, balancers will reduce worker fatigue and improve his efficiency. In locations where tools cannot be suspended, it is common practice to make racks or mounts to hold the tools when not in use.

For the sake of safety and performance, attention should also be paid to the conditions under which the work is performed. Safety practices should be encouraged and the area kept as neat as possible to prevent dirt or grit from entering the hose, coupling, and tool.

Air tools are precision made products. Heavy-duty construction protects against the rigors of normal handling, but the precision internal moving parts require a certain amount of care and maintenance.

A foundry customer of ours was critical of a grinder's performance, and when our field man called there he found that after each use the tool was tossed into a pile of sand. This sort of performance convinces us that care of tools must be promoted; you can't assume the worker knows better.

You can establish a check-out procedure, however, that the tool operator should follow. Our recommendations are:

1. Check general cleanliness of work station.
2. Drain all fluids from the trap by blowing down.
3. Blow out the air hose.
4. Check the oil level in your lubricator.
5. Check screens for clogging.
6. Make sure guard is in place (if tool is so equipped).
7. Make sure oil is going through the tool by holding a piece of white paper by the exhaust port.

This procedure should not take long and will pay for itself in longer tool life and better performance.

The best advice we can give is to make your system installation so foolproof in the beginning that only the most minimum maintenance efforts are demanded thereafter. If this information comes too late to do any good in your case, we'd like to add these maintenance tips:

Blow down the main line at least once a week to clean out water and deposits; once a day for the work stations.

Check compressor intake and exhaust valves and packings according to manufacturer's service manual.

Install a pressure gage at each work station for an immediate check on input pressure. This should simplify the job of tracing poor performance to its source. Check with master gage every 6 months.

Steam-clean aftercooler at least every five years. Oil leakage from compressor sometimes coats pipe with varnish-like substance.

Take a stroll through the plant when the day's work is done and listen for leaky conditions; they may escape detection when the shop is busy.

Install a shutoff valve above the air hose connection, so that defective hoses may be replaced without shutting down the entire system.

Keep accessibility in mind whenever you make improvements on your system. If repairs have to be made, it's better to make them where you can get at them.

Finally, the relatively small cost of properly equipping a work station will build additional confidence in the mind of the operator and encourage special care of the tool and station. Such an improvement in worker attitude can pay dividends in lower maintenance costs and increased production. **End**

Table II. Restrictive effect of couplings, pipe fittings and barbs, at various operating pressures is illustrated in this table.

Percentage of air supply available at the tool with these initial pressures	90 psi		80 psi		70 psi		60 psi	
Length of hose—feet	25	50	25	50	25	50	25	50
1/2-in. ID hose 3/8-in. pipe fittings	100	90	90	84	79	73	57	53
1/2-in. hose, quick-change couplings	100	90	90	86	77	69	53	51
3/8-in. hose, 1/4-in. pipe fittings	100	90	86	86	71	57	55	53
3/8-in. hose, quick-change couplings	100	90	77	75	61	56	47	47
1/4-in. hose, 1/4-in. barbs	63	51	49	41	37	35	27	25
1/4-in. hose, quick-change couplings	51	43	39	37	35	29	24	22

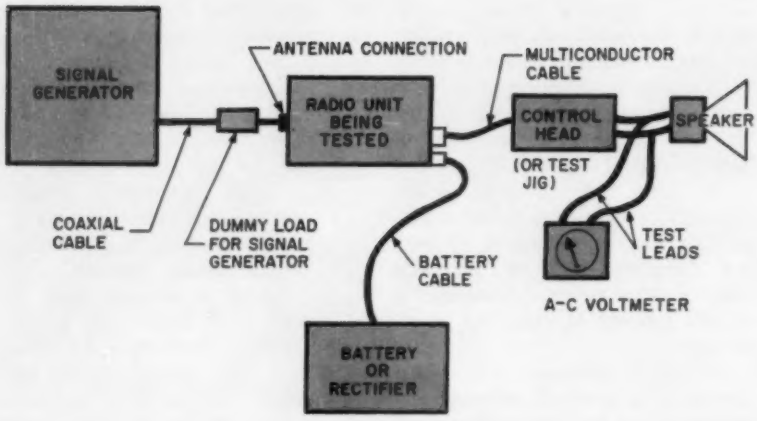


Fig. 1. Bench setup for testing receiver sensitivity and squelch action using a signal generator as radio signal source.

INDUSTRIAL RADIO MAINTENANCE

By LEO G. SANDS,
Ridgewood, New Jersey

TWO-WAY RADIO communication is being used in many industrial plants to solve the problem of rapidly locating key maintenance personnel in emergencies. Modern plants are spread out over large areas and the ability of two-way radio to maintain close contact with these men has been responsible for a substantial reduction in equipment downtime.

Use of two-way radio communication in industry was given new impetus when the Federal Communications Commission (FCC) recently opened more radio channels to industry. These channels are known as the manufacturers radio service and the business radio service.

Radio equipment must be properly maintained, not only to insure continued operation but because it is required by FCC regulations and cannot be ignored. You cannot put it off until later but must perform certain routine tests and adjustments at stated intervals.

When a plant has only a few two-way radio units, it is more economical to farm out the maintenance work to an outside service organization, when there is one in the vicinity. This can still be done, doing business with a service firm in another city, and if spare equipment is kept on hand.

In many cases spare equipment is provided which is used to replace two-way radio units needing repairs or routine preventive maintenance. The spare radio units are installed and removed by plant maintenance personnel. The equipment needing service is picked up or shipped to the service contractor who returns it, ready for use when needed.

As the extent and complexity of the radio communications system grows, it may become more economical, and decidedly more convenient, to have much of the maintenance work done by plant personnel. The radio equipment need not absorb the entire cost of employing skilled personnel when there are other electronic and electrical devices that need maintenance. Often, existing plant personnel can be trained to handle radio maintenance.

At least one person in the plant maintenance group must hold a first or second class radiotelephone operator license, an FCC requirement for making adjustments to radio transmitters. Unlicensed persons may also do this work, but only under the personal supervision of a licensed man. Almost anyone with knowledge of basic electronics can, with a little study, pass the written examination which is administered at an FCC field office. There are several books available which can be used as a study guide.

There are many jobs that can be performed by unlicensed personnel without a licensed man present. The only chores they cannot legally perform when a licensed man is not on the scene, are adjustments to radio transmitters which affect frequency or otherwise cause the transmitter to function in an illegal manner.

Besides personnel, test equipment as listed in the table is required. The table lists some of the equipment most widely used for radio maintenance. In addition, spare tubes, vibrators and parts should be kept on hand.

Since the FCC is concerned only with transmitters, not receivers and other associated components of a two-way radio system, the routine maintenance functions required by FCC regulations include measurement of transmitter frequencies, measurement of transmitted modulation and measurement of transmitter power. These measurements must be made at regular intervals, about once every six months.

Results of these measurements

must be recorded in a written log kept at the base station or office unit. The person who makes these measurements must note the date and sign his name and operator license number as well as its expiration date in the log. The log also contains a record of all repairs to the office station as well as the mobile unit.

There are several types of frequency meters on the market which meet FCC requirements. There are the continuously tunable types, which cover all of the mobile radio bands. These are used with a separate device for measuring modulation on frequency deviation. There are also combination frequency and modulation measuring instruments which are used for measuring one or more specific channels only.

Almost anyone can follow the instructions furnished with these instruments and can make transmitter frequency measurements. The licensed man in a maintenance group can easily teach his associates how to make these measurements, but he should verify the readings and record them in the log.

Purpose of the frequency measurement is to make sure that the transmitter emits its signal precisely on the assigned frequency so that it will not interfere with transmissions on another frequency. The modulation measurement shows how far the transmitted signal swings back and forth from its assigned frequency as the microphone is spoken into. If it swings beyond legal limits, interference can be caused to other radio stations. If it is found that the transmitter does not operate within the specified limits, proper adjustments should be made by a competent technician.

In addition, it should be determined how much power is being applied to the transmitter. The FCC is not concerned with radio frequency power output, which can be measured with a radio frequency wattmeter, but with the d-c input to the final RF amplifier stage of the transmitter. This is a simple measurement. The plate voltage is measured and so is the plate current. The power input is the product of the voltage and current in amperes. Most sets are provided with metering jacks which facilitate making this measurement.

Maximum performance is assured by administering preventive maintenance. By having spare radio units on hand, any employee may remove a unit from a vehicle or office and replace it with a freshly serviced unit. This operation generally consists of disconnecting the cable connectors from a unit being removed and connecting them to the unit being placed in service.

The removed unit is then taken to the plant's maintenance shop or sent to an outside contractor for servicing. Preventive maintenance includes the following steps:

1. Removal of accumulated dust with a gentle air blast.
2. Visual inspection, noting any discoloration of parts due to excessive heating.

(Turn page)

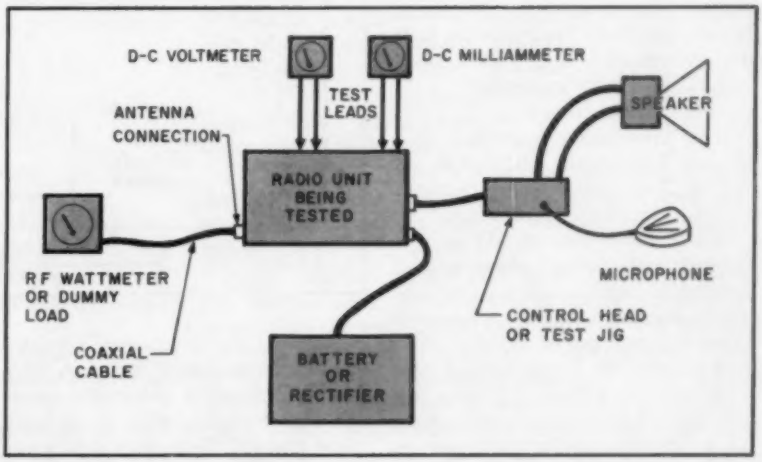
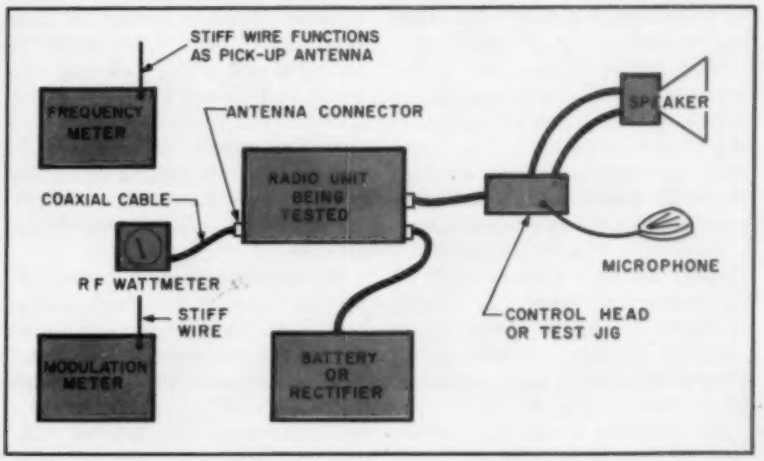


Fig. 2. Measuring transmitter input. When a metering socket and test meter are provided, voltmeter and milliameter are usually not required.

Fig. 3. Testing transmitter frequency, modulation and power output. Stiff wires serve as antennas for frequency and modulation meters.



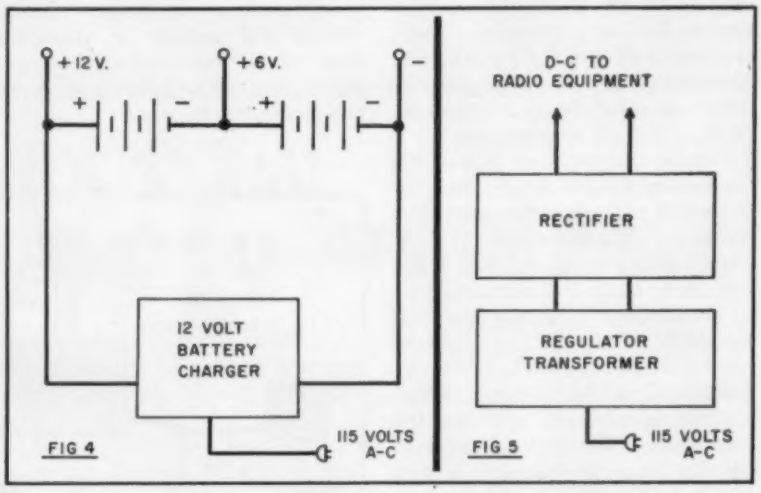
Fully equipped shop can help keep equipment downtime to a minimum.

Instrument	Purpose
Frequency meter	Measurement of transmitter frequencies
Modulation meter	Measurement of transmitter frequency deviation
VHF-UHF signal generator	Receiver RF alignment and sensitivity tests
HF signal generator	Receiver IF alignment
RF wattmeter	Transmitter power output measurements
Dummy load	Substitute for antenna when making adjustments
Vacuum tube voltmeter	General purpose testing
Volt-ohm-milliammeter	General purpose testing
Oscilloscope	Troubleshooting

Table listing of test equipment most widely used for two-way radio maintenance and the purpose of each item.

Fig. 4. Two 6-v automobile storage batteries may be connected in series for servicing 6 and 12-v radio units.

Fig. 5. Regulated rectifier power supply with variable voltage output is ideal for shop testing of radio equipment.



3. Tube testing. Each tube is removed, one at a time, tested with a tube tester, and replaced in the *same* socket from which it was removed.

4. Electrical test. The unit is connected with suitable jigs to permit bench operation. The following tests are performed:

a. Receiver sensitivity
b. Squelch action
c. Transmitter frequency
d. Transmitter modulation
e. Transmitter power output
f. Transmitter power input

All of these tests should be performed with normal input voltage applied as well as at reduced and above-normal voltages, as encountered in actual use on vehicles. With a 6-v unit, the input voltage may vary between 5.5 and 7.5 volts, the nominal 12.6-v input can vary from 11 to 15 volts, and a 32-v rated input can vary from 29 to 40 volts. The equipment should perform under these conditions. Obviously, receiver sensitivity and power output will be reduced at lower input voltages and increased at higher voltages. Borderline defects may manifest themselves during these tests.

Shop testing of transmitters and receivers is readily accomplished by setting up equipment to duplicate in-service conditions. In Fig. 1, we show a setup for testing receiver sensitivity and squelch action using a signal generator as a signal source.

To comply with FCC regulations, a power input test must be made on the transmitter every six months as shown in Fig. 2. Another test setup for checking transmitter frequency, modulation and power output is shown in Fig. 3.

For servicing 6 and 12-v mobile radio units, two 6-v storage batteries may be connected in series. A 12-v battery charger is connected across the two batteries, Fig. 4, to keep them charged. Tests should be made with the battery charger turned "off" as well as with it turned "on" to note any change in performance as input voltage varies.

A rectifier power supply, Fig. 5, whose output voltage can be varied is ideal for shop testing of radio equipment. The rectifier should be equipped with a direct current voltmeter and should have a high degree of voltage regulation. Best results can usually be obtained by using a constant voltage transformer between the rectifier and the power line to offset input voltage changes.

Equipment makers ordinarily provide comprehensive service manuals with their equipment which spell out troubleshooting procedures. With experience, these procedures become easy. There are troubles, however, which are seldom noted in these manuals. These include a tube defect known as "grid emission", which can raise havoc with two-way radio equipment and which is a common cause of trouble in TV sets.

Most general-purpose tube testers test for shorts and merit, which is an indication of dynamic mutual conductance, plate conductance or cathode emission. Many tube testers are provided with a "gas" test which may reveal severe grid emission but will not expose mild cases which are of severe enough gravity to cause erratic operation.

For this important test, a special grid circuit tester, such as the Seco GCT-8, may be used. This simple, inexpensive tester is used in addition to a general-purpose tube tester, and is very effective in revealing grid emission and inter-electrode leakage. A tube with grid emission usually checks OK in a general-purpose tester but may cause erratic operation in actual use.

(Continued on page 282)

time saver series

CONSTRUCTION COST ESTIMATING PART 11

ACOUSTICAL TILE AND RESILIENT FLOORING

Acoustical tile is finding widespread use in industrial plants, particularly in office installations, to absorb and deaden sound. The tiles are made of many different materials: wood fiber, cane fiber, mineral wool, cork, specially-processed mineral filaments, perforated metal, glass fibers and other insulating materials.

Methods of application vary. The tiles can be applied by cementing on surfaces, nailing or screwing to

ACOUSTICAL TILE

furring strips, or mechanically suspending with hidden or exposed flanges of T beams.

An acoustical material should be selected that has an approximate noise reduction efficiency of .70, and a reflective value of 75 per cent. Resistance to fire varies; some acoustical material is combustible, some incombustible, and some is slow burning.

Maintenance should be considered when selecting a tile system . . . can the material be washed or painted without loss of efficiency?

An acoustical ceiling should not be installed until after the building is fully enclosed and all "wet" operations such as plastering and cement work are done. The heating or air conditioning system should be operating so that the building is thoroughly dried out.

Acoustical value of an installation is increased when there is an air space above the tile. However, this air space should be vented to the outside.

Factors affecting the cost of an installation include the type of edge molding and light fixtures used. Recessed fixtures increase the cost due to the extra framing required.

Sound attenuation between offices should be taken into consideration. If privacy is of prime importance, material which will prevent passage of sound through the suspended ceiling, over the partition and down through the suspended ceiling in the other room, should be selected. The denser the material, the more effectively sound transmission is reduced from one area to another.

Summary: Acoustical Tile Ceiling Costs, Based on 1000 sq ft Area

Material	Size, in.	Thickness, in.	Cost per sq ft	Method of Installation	Installed Cost per sq ft
Wood or cane fiber	12 x 12	1/2	$0.16	Cemented	$0.30
Wood or cane fiber	12 x 12	3/4	.23	Cemented	.35
Wood or cane fiber	12 x 12	1/2	.16	Wood furring	.45
Wood or cane fiber	12 x 12	3/4	.23	Wood furring	.50
Wood or cane fiber	12 x 12	3/4	..	Suspended	.50
Mineral fiber	12 x 12	3/4	.41	Cemented	.55
Mineral fiber	12 x 12	3/4	.41	Suspended	.65
Glass fiber	24 x 48	3/4			.50 (small area)
	24 x 24	3/4	.27	Suspended	.45 (large area)
Metal face tile	24 x 24		.30	Suspended	.60
Cavity tile	24 x 24		.24	Suspended	.55
Metal pan, steel	12 x 24		.60	Suspended	.90
Metal pan, aluminum	12 x 24		.80	Suspended	1.10
Metal pan, anodized aluminum	12 x 24		.90	Suspended	1.20
Corrugated aluminum	24 x 48		.40	Suspended	.70

Prices for areas of 500 sq ft are 20 per cent higher.

Wood or cane fiber. Perforated, size 12 in. by 12 in. Durable, but combustible; can be specially painted to make it slow burning, at a cost of two cents per square foot. Minimum recommended thickness, ¾ in. Use 1½-in. channels on 4-ft centers, supporting a suspension system made up of a grid of H sections and T sections.

Cementing a 12-in. by 12-in. tile requires about three cents worth of cement, and about eight cents worth of labor.

Mineral fiber. Perforated or fissured, size 12 in. by 12 in. Incombustible.

Glass fiber. Perforated or fissured, size 12 in. by 12 in. Incombustible. Installed in exposed T having painted grid.

Metal face tile. Glass fiber backing. Size, 24 in. by 24 in. Installed in exposed T section.

Cavity tile. Paper backing, perforated, incombustible. Size 24 in. by 24 in., installed in exposed T section.

Metal pan. Wire grid laid in metal pan supports a glass fiber or rock wool pad wrapped in sound transmitting paper. Pan is snapped into place on concealed T grid system.

Corrugated aluminum. Perforated, with sound absorbing blanket placed on top. Installed on exposed T grid system.

RESILIENT FLOORING

The cost of laying resilient flooring varies with the size and shape of the floor area to be covered, the size of the tile, and the kind of sub-floor.

Wood floors, for example, must be smoothed, loose boards nailed down, and lining felt applied before tile or linoleum is cemented down.

Costs presented here are based on a floor coverer earning $3.20 per hour, plus $0.14 per hour vacation and welfare fund, for a total of $3.34 per hour. A floor tile contractor usually charges $6.00 per hour, to offset the cost of truck operation, and cover overhead and profit.

Asphalt tile. Lowest in cost, brittle, high maintenance, fair selection of colors, can be used on or below grade. On concrete or plywood, use ⅛-in.-thick tile; on board floor, use 3/16-in. tile. Not greaseproof, size 9 in. by 9 in. Price varies with color; darker colors are lowest cost.

Vinyl Asbestos. Application cost is the same as asphalt, but tile requires less maintenance. Vinyl asbestos tile, ⅛-in. thick will outwear 3/16-in. asphalt tile three to one. Can be used on or below grade; greaseproof; will resist mild alkalies and acids; size 9 in. by 9 in.

Linoleum. Best application, wood floors. Cannot be used on or below grade. Greaseproof. Most commonly used in its ⅛-in. thick burlap backed form, but is available 3/32-in. thick, felt backed.

Pure Vinyl. Exceptionally durable, little maintenance, colors unlimited. More expensive to apply than asphalt. Can be used on or above grade; if laid on grade, a special expensive adhesive must be used. Size 9 in. by 9 in.; ⅛-in. and 5/64-in. thick. Price depends upon color.

Cork. Requires maintenance, not greaseproof. With a special adhesive, can be applied to concrete on grade. Tiles available ⅛-in. or 3/16-in. thick.

Rubber. Like cork, requires maintenance, is not greaseproof, and must be laid with special adhesive if applied to concrete on grade. Size 9 in. by 9 in., ⅛-in. or 3/16-in. thick.

Summary: Resilient Flooring Costs, Based on 700-800 sq ft Area

Material	Size, in.	Thickness, in.	Color	Cost per sq ft	Installed cost per sq ft	
					On wood	On concrete
Asphalt	9 x 9	1/8	A-B	$0.12	**$0.27**	**$0.22**
Asphalt	9 x 9	1/8	C	.14	**.29**	**.24**
Asphalt	9 x 9	1/8	D	.16	**.31**	**.26**
Asphalt	9 x 9	3/16	A-B	.19	**.35**	**.30**
Asphalt	9 x 9	3/16	C	.23	**.39**	**.34**
Asphalt	9 x 9	3/16	D	.27	**.43**	**.38**
Vinyl-Asbestos	9 x 9	1/16		.25	....	**.35**
Vinyl-Asbestos	9 x 9	1/8		.42	**57**	**.52**
Linoleum		1/8	Plain	.42	**.58**	**.53**
Pure Vinyl	9 x 9	1/8		.80—1.10	**1.00—1.30**	**.95—1.25***
Cork	9 x 9	3/16		.70	**.85**	**.80**
Rubber	9 x 9	1/8		.70	**.85**	**.80**
Quarry tile	6 x 6	3/4		.57	....	**1.93**

A, B, C and D represent color grading of tile. A is lowest cost, D is highest.
*Price varies with color of tile.

Rubber cove base, black, 4 in. high $0.45 per ft installed.
6 in. high .51 per ft installed.

Sanding wood floors, $0.07 per sq ft. Lining felt, $0.12 per sq yd.

Cement: for asphalt and vinyl asbestos, $4.75 for 5-gal can.
for rubber, linoleum, cork and felt, $6.75 for 5-gal can.

HOW TO DESIGN

PNEUMATIC-HYDRAULIC ACTUATION SYSTEMS

SIXTH IN A SERIES OF ARTICLES

Part VI. Designing handling and moving devices for parts and materials during production

PLANT ENGINEERING departments are often called upon to provide a means for moving or handling material during the production process. How elaborate this means will be depends upon the nature of the movement, production requirements and the weight of the material.

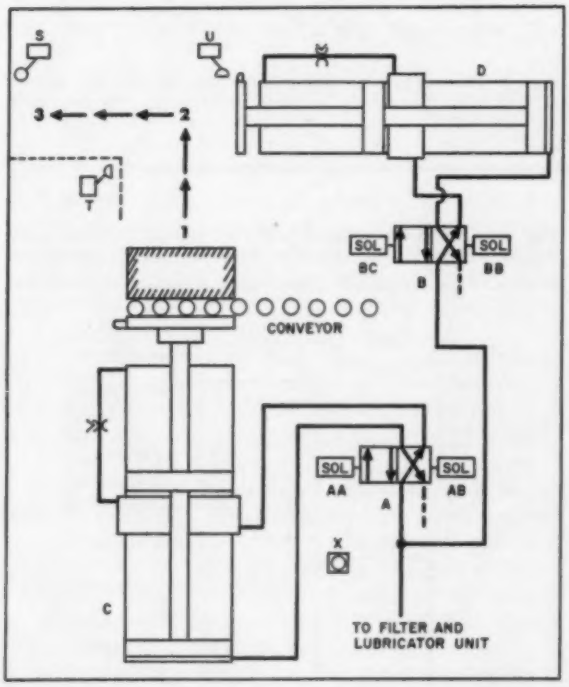


Fig. 1A. Two air-hydraulic cylinders are used in this circuit for moving parts trays from one station to another.

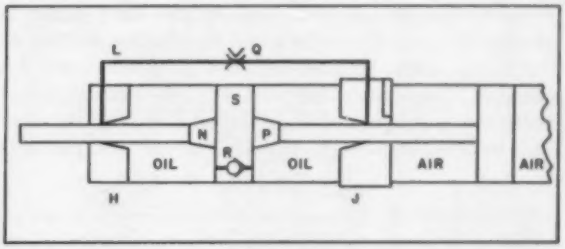


Fig. 1B. Detail drawing shows air-hydraulic cylinders, used in preceding drawing, designed with built-in cushions.

If the material to be moved is handled only occasionally—examples: a drum of oil, a load of steel, or a container of powdered materials — then equipment such as hoists, jacks, etc. may be used. If it is a production item then the handling device should be pneumatically or hydraulically controlled. In this article we will discuss some of the pneumatic circuits used to move the workpiece.

Special consideration must be given to handling fragile workpieces such as television tubes, pottery, cores for castings, foodstuff and precision instruments. Considerable losses can be involved due to poorly planned handling equipment.

Let us look at a couple of circuits which can be used for handling fragile materials. It is of prime importance that the fragile workpiece be gradually accelerated and decelerated. As previously discussed it is difficult to accurately control the movement of an air cylinder piston but by using hydraulic means to assist, it is pos-

HOW TO DESIGN PNEUMATIC-HYDRAULIC SYSTEMS

sible to achieve smooth, controlled movements at a cost far less than when using a hydraulic system.

In Fig. 1A where we want to move a tray of workpieces from station 1 to station 3 via station 2, two air-hydraulic cylinders are used. Air-hydraulic cylinders used in this circuit are designed with built-in cushions, as shown in Fig. 1B, which act as acceleration and deceleration controls. This design eliminates much external piping and additional valving. Cushion P allows the piston to accelerate as it moves out of cover J and cushion N causes deceleration as it moves into cover H. Valve Q controls the speed when the cushions are away from the covers. Check valve R in piston S allows for rapid retraction after work has been completed.

If control is desired in both directions R should be eliminated. The cushions should be designed with a slight taper or with a tapered groove cut in them. The length of the cushion depends upon the load moved and the acceleration and deceleration desired.

In using the circuit in Fig. 1 the operator loads the tray and momentarily depresses push-button X. This causes solenoid AA of valve A to be momentarily energized. Spool of A is thus shifted, directing air pressure to blind end of lift cylinder C. Piston movement is uniformly accelerated by the cushion arrangement in the closed hydraulic system.

As the piston causes the tray to approach station 2 gradual deceleration takes place. Just before the end of the stroke, roller of limit switch T is momentarily depressed. This causes solenoid BC of valve B to be energized and spool of B is shifted directing air pressure to blind end of cylinder D. Tray of workpieces is transferred from station 2 to station 3 with a uniform accelerated and decelerated movement.

At end of stroke, the cam on pusher trips limit switch S which energizes solenoid BB of valve B causing spool to shift and air pressure to be directed to center cover of air-hydraulic cylinder D; piston retracts rapidly due to the free oil passage through the oil piston. As piston of D approaches retracted position, roller of limit switch U is depressed.

This energizes solenoid AB of valve A, spool is shifted, and air pressure is directed to center cover of cylinder C. Piston is rapidly retracted to starting position. Limit switches T and U are equipped with rollers that have a flat side so they will actuate only in one direction. The same thing can be accomplished with a swing type cam. The cam will be rigid in one direction of movement but will swing clear in the other.

The circuit in Fig. 2 performs the same function but extra valving and piping on each cylinder is required. Cam-operated deceleration valves X and Y provide for gradual acceleration and deceleration. Really the only advantage of the external deceleration valves is that the length of the acceleration or deceleration cycle can be changed to suit the application. This is accomplished by changing the length of the cam.

Circuit in Fig. 1 may easily be converted into an automatic cycle by a slight addition. The plant engineer should design his equipment with the thought that sometime may be necessary to automate it.

Figure 3 shows how the addition of some mechanical parts can make the circuit into a completely automatic cycle. For example, a tray or container may be filled from a chute. When the container is filled the weight will automatically trip a limit switch which will close

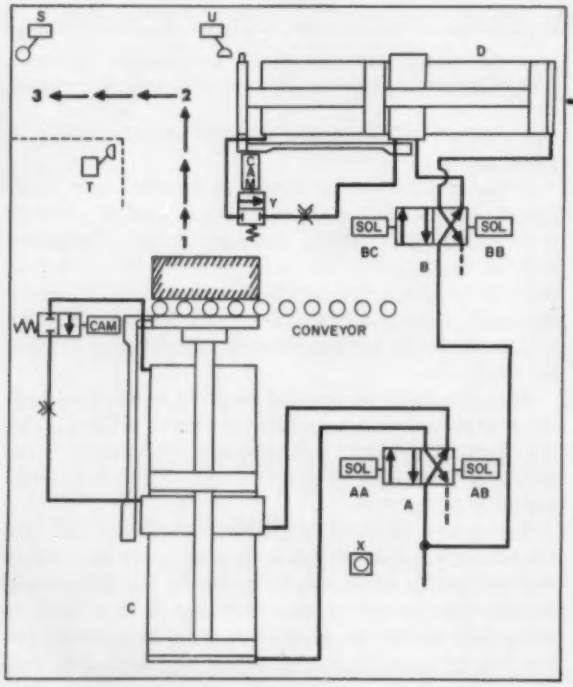
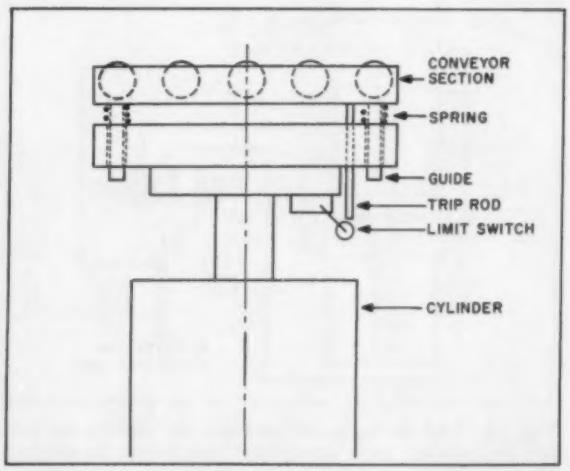


Fig. 2. This circuit performs same function as one shown in Fig. 1A, but extra valving and piping are required.

Fig. 3. This sketch shows how, by the addition of some mechanical parts, circuit can be made completely automatic.



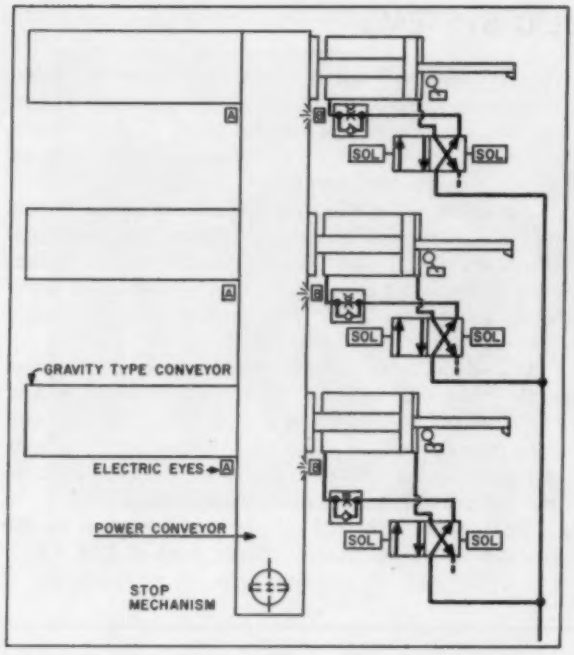


Fig. 4. This is a separating circuit in which various sized packages can be sorted, directed to correct areas.

the chute, and cause the valve to shift which raises the load to station 2. At the completion of the cycle, when the next tray moves automatically into place, a limit switch will be contacted causing the chute to open and the cycle will repeat.

In Fig. 4 we have a separating circuit in which various-sized packages may be sorted on conveyors and directed to the correct storage area.

Keep in mind this is only a basic idea and that refinements may be needed for your particular operation. In any event try to keep your system as simple as possible. In this circuit we are using electric eyes to provide the electric impulse for energizing the solenoid of the four-way valve. Limit switches may be used in place of the electric eyes. If the cartons are of different heights, the pairs of electric eyes are installed in such a manner that the tallest package will be ejected first, the next to the tallest, second, etc. If the cartons are of different widths limit switches may be more desirable than electric eyes.

If slowly moving transfer cylinders are used, i.e. cylinders that are cushioned (as in Fig. 1), it may be necessary to install some type of stop mechanism in order to allow the cartons to enter the transfer section one at a time. This stop mechanism can be operated by a small air cylinder or by a solenoid.

Where only two different size objects are to be separated, or where the objects are all of the same size but part of them are to be sent to the storage area and part are to be sent to the loading dock, a single air cylinder can actuate the switching mechanism. This device can be operated from the packaging station or from somewhere along the conveyor line.

Sometimes the device is located at the loading dock so that when the conveyor is full the switch can be operated to direct the overflow to the storage station. If solenoid-operated control valves are used the actuator, such as a pushbutton, can be located at a considerable distance from the valves yet have almost instantaneous action.

To transfer workpieces where adverse conditions prevail—such as excessive heat, acid fumes, explosive atmospheres or extreme humidity—the use of pilot controls are advantageous. In Fig. 5 we have a material transfer circuit which is automatic but is actuated solely by pilot control valves. The workpiece which could be a hot billet, a coil of sheet stock or some other object, moves down the conveyor until it contacts cam-actuated, three-way pilot valve G. Air pressure is directed through pilot line to pilot connection DD of four-way, pilot-operated valve D. Spool in D is shifted and air pressure is directed to blind end of transfer cylinder A.

Object is moved until roller of pilot valve H is depressed. Piston of A is retracted. Pilot pressure is directed to pilot connection EE of valve E which shifts spool in E and air pressure flows to blind end of rollover device cylinder B and object is rotated 90 deg. As rollover device reaches extended point the roller of pilot valve J is momentarily depressed which directs pilot pressure to FF of valve F and spool of valve shifts.

Air pressure is next directed to blind end of cylinder C and piston moves forward ejecting object from rollover device onto power feed conveyor. Piston of C is retracted as roller of pilot valve K is depressed. As piston of C approaches retracted position, roller of valve L is momentarily contacted which causes pilot pressure to EF of valve E and spool shifts. This directs air pressure to rod end of cylinder B and rollover de-

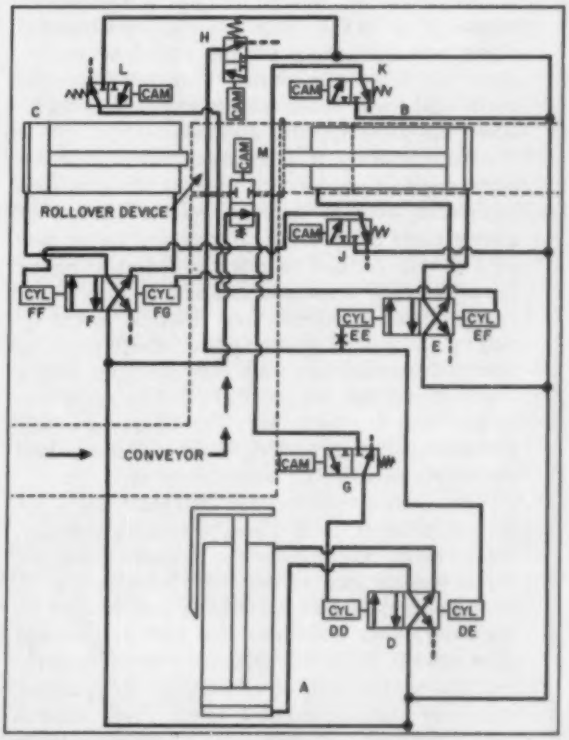


Fig. 5. This is a material-transfer circuit which is automatic but is actuated solely by pilot control valves.

HOW TO DESIGN PNEUMATIC-HYDRAULIC SYSTEMS

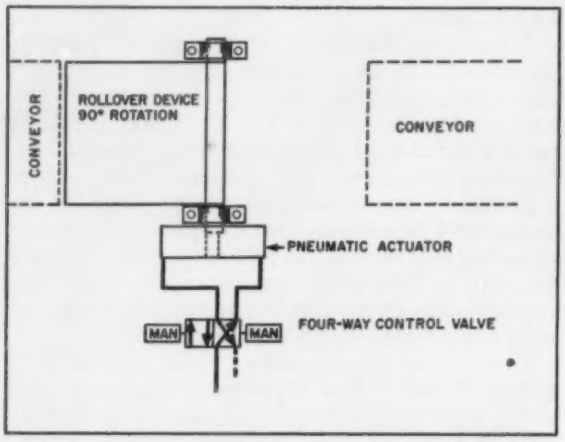


Fig. 6. Pneumatic actuator, one of devices for producing rotary motion. Here it is attached to hub of pivot point.

vice repositions. When it repositions it depresses roller of two-way valve M which allows pilot pressure to flow to valve G. This provides added safety so that there is no possibility of piston A advancing while rollover device is in the tilted position.

The cylinder for operating the rollover device should be either a pivot or trunnion mounting type so that it is free to swing. It should be piped up with flexible lines such as hose. If the load to be tilted is extremely heavy then provision should be made to cushion that load after it passes over the center position.

One of the newer devices to produce a rotary motion is the pneumatic actuator. It is attached to the hub of the pivot point as shown in Fig. 6. This makes a compact package. Where loads are excessive it is usually necessary to use hydraulic power to operate the actuator. Operating pressures often reach 3000 psi.

Next installment will discuss the movement of the workpieces by pneumatic devices. **End of Part VI**

How One Plant Engineer Solved a Plant Problem

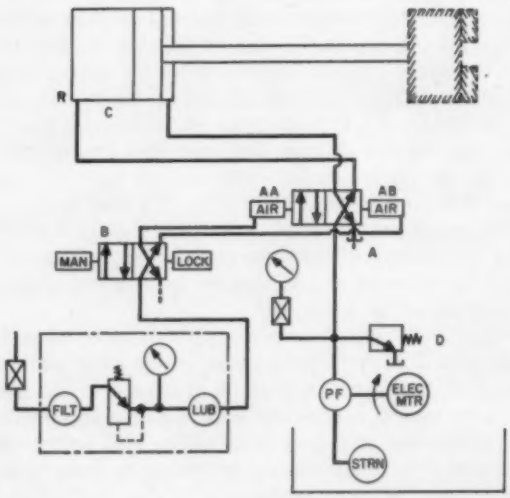
AFTER PLACING a group of single-spindle, automatic chucking machines, equipped with pneumatic operated chucks, in one section of the plant it was found that the air-operated chucks would not properly hold the workpieces. Investigation proved the trouble due to: 1. Insufficient volume of air in this portion of the plant because piping was inadequate for the added air equipment. 2. When the chucks were revolving the centrifugal force would tend to cause the jaws to open thus loosening the workpiece.

After checking this situation thoroughly the plant engineer decided to change the chucking equipment over to hydraulic power instead of adding more compressor capacity and larger piping. It was decided to place a hydraulic power device at each automatic chucker so that if one power device failed only one machine would be tied up. In order that each power device could be operated continuously each was equipped with a 5-gpm pump operating at 150 psi. The pump was driven with a 1-hp motor. The 20-gal reservoir provided sufficient cooling without using a heat exchanger even in the hottest weather.

The rotating cylinder was changed from a 10-in. air cylinder to a 10-in. hydraulic cylinder. Since these machines were already piped for air it was decided to use the circuit shown.

A connection was made from just beyond the regulator, filter and lubricator unit to four-way pilot valve B. From this valve two lines were run to the pilot connections of valve A, an air-operated, four-way hydraulic control valve. From valve A two lines were directed to the rotating cylinder and two lines to the power unit; one line was the pressure line and the other, the exhaust line.

To close the chuck, the operator moves the actuator 90 deg. Air pressure is thus directed to pilot connection AA of valve A, spool is shifted and oil pressure is directed to rod end of rotating cylinder C. If slightly more pressure is desired an adjustment can be made on relief valve D. Since only one cylinder is operated from any one power device there will be no fluctuation in line pressure. Centrifugal force will have very little effect on the chuck. **End**



This circuit was designed by the plant engineer to give sufficient power to chucks to hold workpiece.

Rough, dried accumulation shown on the pulp reducer's undersurface reflects destructive effects of chemicals. Mechanic is inserting packing into the stuffing box.

Installation of packing into packing gland of Jordan in plant of eastern paper manufacturer.

TOUGH PACKING GETS TOUGH JOB

PULP REDUCERS, Jordans and breaker traps in the eastern division mill of a large paper manufacturer, now enjoy ten times their previous continuous operating life because of a new packing.

With unique chemical and abrasion resistance characteristics this packing has reduced replacements by approximately 80 per cent. Where 11 packing sets were formerly used over a 20-week period, 9 have been eliminated. Production capacity loss caused by idle machinery has also been considerably reduced. Because of the packing's resistance to friction and heat, less scoring of shafts and sleeves has also resulted.

Packing Attacked by Chemicals, Abrasion

Packing in all of these machines is subjected to intense chemical and abrasive attack because of the ingredients used in processing pulp board. Pulp reducers, in which large bales of waste paper are mixed with chemicals and very hot water, form a liquid slush which is hurled about by large blades. This action sluices away, through perforated screens, impurities and foreign matter in the bales of paper.

Cleaned slush is processed through a breaker trap, which defiberizes large flakes of stock which have not been reduced by preliminary treatment at the pulp reducer. Following the treatment in the breaker trap, the slush is pumped from a refiner dump chest into the Jordan, which gives the slush a final screening. The Jordan further defiberizes or shortens the stock fibers.

The destructive action on packings by the process used in breaking down the bulk paper stock has made packing a principal maintenance problem. Packings must resist the vibration and pressure caused by the action of the machine blades. By protecting parts from friction and abrasion produced by the cutting action of the shredded waste paper, packing should also help minimize wear on machinery shafts and sleeves.

New Jersey Engineering Company, distributor for Raybestos-Manhattan packings, suggested to the master mechanic that the new packing be installed on a trial basis to demonstrate how packing problems could virtually be eliminated. The trial packings were installed in production machines in July, 1959. In November, 1959, when they were removed (not because of failure but for examination) they were still in good enough condition to be re-inserted into the machine. This test run shows the new packing had a life of at least 20 weeks.

It is constructed of square plaited braided asbestos yarn with a unique combination of two lubricants—an initial impregnated transient lubricant and a neutral, graphite-free surface lubricant, which continues to provide needed protection after the transient lubrication has been dissipated. **End**

Inside plants and refineries:

What can you do about moisture, oil or corrosives that attack your wiring?

One refinery actually tested the corrosion resistance of building wire *on the job:*

Regular TW . . . neoprene-covered . . . braided rubber-insulated . . . lead-covered . . . and *Rome Synthinol 901!*

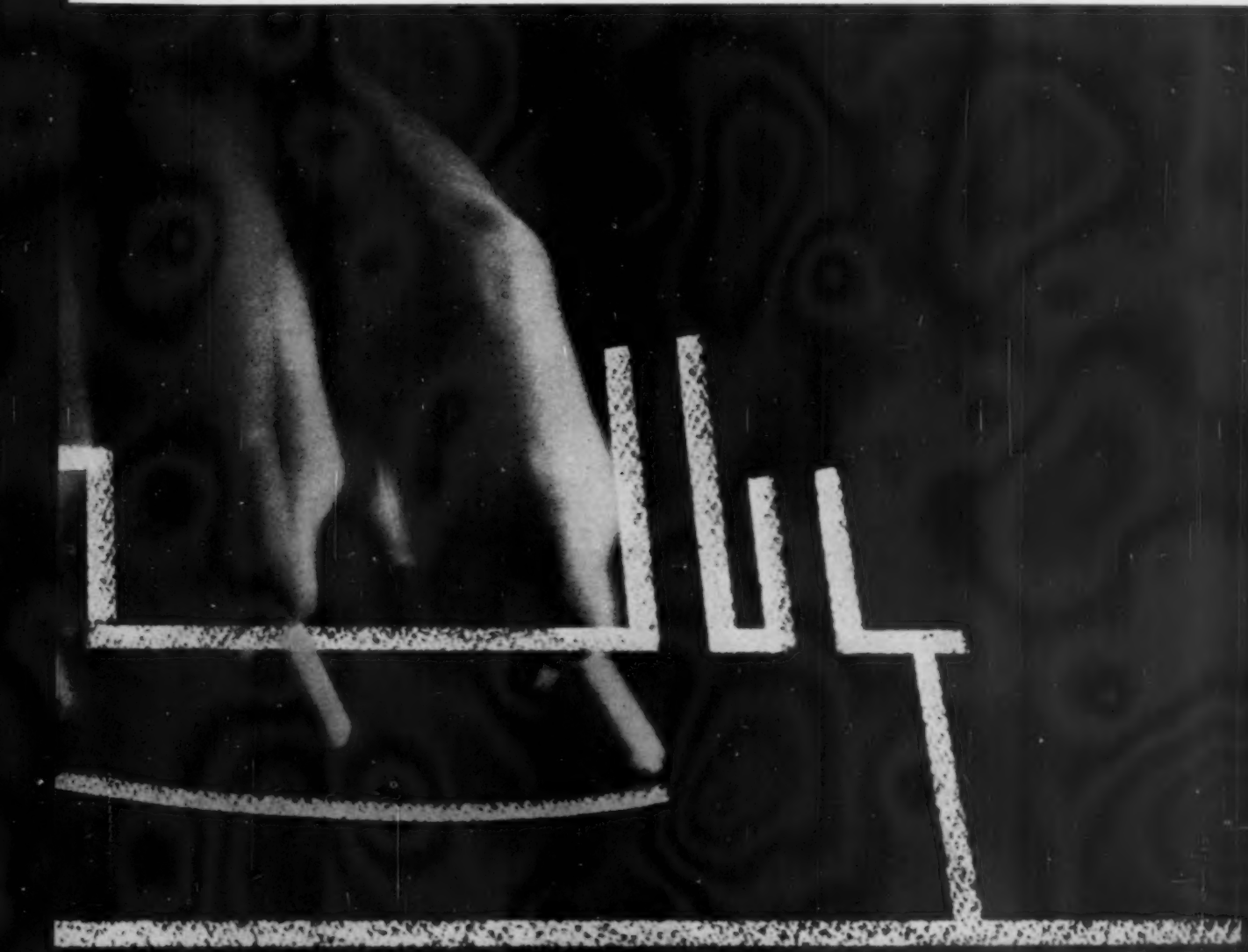
RESULT: Only Synthinol 901 and the lead-covered wire held up under exposure to corrosives.

BEST BUY: Rome Synthinol—lower in cost and easier to handle than lead-covered wire.

Synthinol 901 has been proved in the lab and on the job for its resistance to moisture, oil and corrosive vapors. You can recommend it to your industrial customers for any low-voltage application—600 volts and under—including control circuits, plant and refinery equipment, and general wiring of office and warehouse buildings.

Where higher than normal heat conditions exist, you can recommend Synthinol 901 for its superior heat-deformation resistance. You can even use it to replace varnished cambric insulation on oil-filled transformer leads, where the leads are constantly immersed in hot oil.

Get further information, including lab test results, on Rome Synthinol 901—yours for the asking from Rome. Just clip the coupon, mail it today!



Power source to plant—Rome Cable gives you the *right* answer to every wiring problem. Power station to substation: Rome's interlocked armored cable "installs like cable, protects like conduit." Substation to plant or refinery: Rome's preassembled aerial cable goes up fast—even through trees—and is well protected from storms. Inside plant or refinery: Rome Synthinol gives maximum corrosion resistance, assures dependable service.

For more facts circle 573 on Reply Card

ROME CABLE
DIVISION OF **ALCOA**

Department 5-50, Rome, N. Y.

☐ Please send me more information on the above.

Name .....

Title .....

Company .....

Street .....

City ..... Zone ..... State .....

ALCOA
ROME CABLE
DIVISION

COOLING WATER TROUBLES AND TREATMENT

Part 2. This part, completing the discussion, includes information on deposit prevention and protection of tower lumber

By J. S. BEECHER, Chief Chemist, Power Chemicals Div., E. F. Drew & Co., New York City

WATER PASSING over or through the earth's surface will dissolve such compounds as calcium carbonate, magnesium carbonate, calcium sulfate, magnesium sulfate, silica and iron compounds. When carbon dioxide is not present in the water, the solubility of calcium carbonate is small. However, when carbon dioxide is present, the water becomes acidic and calcium carbonate becomes quite soluble. This is due to the formation of bicarbonate ion.

Actually, the bicarbonate ion is a loose combination of the carbonate ion, carbon dioxide and water. Therefore, when carbon dioxide is present in the water, the water will contain calcium, magnesium, ferrous iron, bicarbonate, and sulfate ions and dissolved and colloidial silica. Other ions are also present.

Deposits

Under the influence of concentration and heat, the solubility of certain calcium, magnesium, and iron compounds may be exceeded. If this condition occurs, these compounds come out of solution. The reverse reaction to the formation of the bicarbonate ion occurs, thereby making available the carbonate ion. The calcium ion can therefore combine with the carbonate ion to form calcium carbonate. The calcium ion may also combine with the sulfate ion or silica, to form the gypsum form of calcium sulfate or calcium silicate. These compounds can precipitate right out of solution onto metal surfaces and result in the formation of dense hard scale.

When the solubility of iron compounds is exceeded, the result is that these compounds precipitate out and adhere to metal surfaces. Although the solubility of magnesium compounds is generally much greater than calcium compounds, magnesium compounds frequently are found in deposits. This is because the magnesium ion combines with another ion such as the silicate ion to form an insoluble compound such as a magnesium silicate compound.

Inorganic and organic suspended solids, oily matter, or other contamination introduced with makeup water or picked up by the cooling water can become enmeshed with insoluble precipitated compounds that have deposited out on metal surfaces. The uncontrolled use of certain kinds of chemical treatment for preventing scale and corrosion can result in the precipitation of calcium and magnesium compounds which can adhere to metal surfaces.

The objection to the formation of deposits in a cooling water system are: heat transfer is retarded, circulation is restricted, corrosion is promoted by the setting up of concentration cells. There is interference with the action of certain chemical treatment in condensers, coolers, etc., and there is the possibility of attack of cooling tower lumber. The formation of deposits can necessitate costly maintenance and even outages resulting in the loss of production.

The presence of excessive concentrations of chlorine in circulating cooling water can result in attack of the binding lignin.

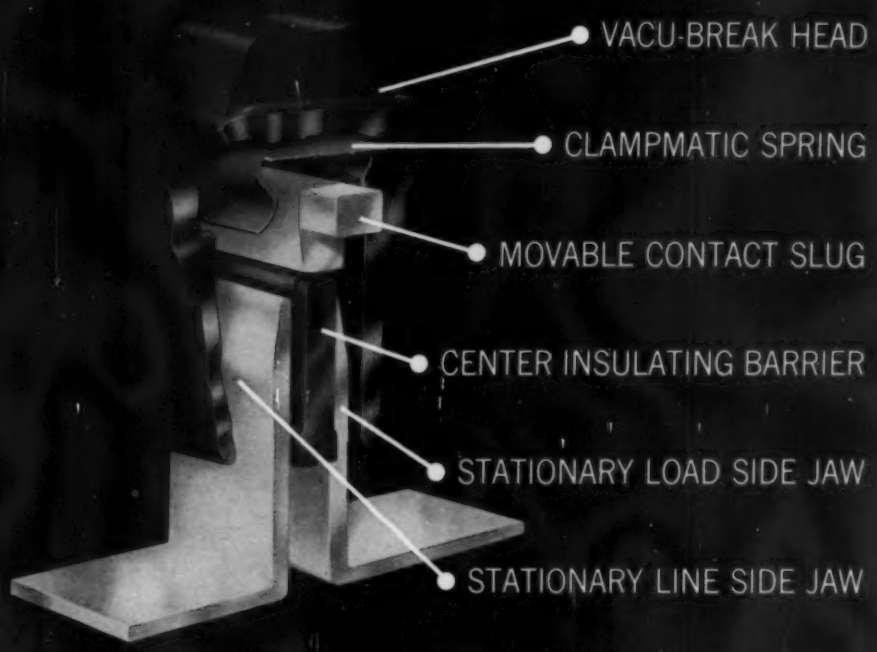
Excessive concentrations of dissolved and suspended solids may contribute to the deterioration of cooling tower lumber. This is especially so at those locations where the wood is alternately wet and dry, or where a spray of water deposits, and leaves the solids upon evaporation. The precipitated solids get under the surface of the wood and weaken its structure. Suspended solids in cooling water act as an abrasive as the water passes over the lumber and wears it away.

Deposit Prevention

The formation of calcium carbonate on metal surfaces in a cooling water system is prevented by the use of antiprecipitating agents or by adding an acid or acid salt to the cooling water to convert bicarbonate alkalinity to sulfate, sulfamate, etc., depending upon which acid or acid salt is used, and then using a corrosion inhibitor to prevent corrosion of metals by the aggressive acid treated water.

Antiprecipitating Agents

Polyphosphates are used to extend the solubility of calcium carbonate. The maintenance of small concen-



THE INSIDE STORY...

Why switches last longer with clamped pressure contact and Vacu-Break arc control

This BullDog Vacu-Break® Switch Head is the reason why Vacu-Break switches stay in action longer.

The unique Clampmatic® spring clamps the contact slug firmly between the line and load jaws . . . provides a virtual bolt-tight connection! This clamped pressure contact prevents overheating while in the "on" position—and as the switch moves to "off," the spring speeds the break. Both features mean longer switch life and improved performance.

Equally important to longer switch life is the action of the Vacu-Break head. Arc chambers enclose the switching contacts. When contacts are broken under load, arcs are smothered quickly. Pitting and burning are cut to the absolute minimum, thereby minimizing maintenance.

BullDog Electric Products Division, I-T-E Circuit Breaker Company, Box 177, Detroit 32, Michigan. In Canada: 80 Clayson Rd., Toronto 15, Ont. Export Division: 13 East 40th St., New York 16, N. Y.

For Safety's Sake Buy Vacu-Break

BULLDOG ELECTRIC PRODUCTS DIVISION
I-T-E CIRCUIT BREAKER COMPANY

KEEP PACE WITH ELECTRICITY

Vacu-Break switch units with clamped pressure contacts are available in BullDog Safety Switches, Switchboards, Vacu-Break Power Panels and Bus Plugs. They cost no more and give your customers the maximum in safety and performance. See your BullDog field engineer.

For more facts circle 574 on Reply Card

trations, 5 ppm or less, of polyphosphate in circulating cooling water will prevent the precipitation of calcium carbonate. The addition of small concentrations of tannins, lignin and organic sequestering agents enhances more yet the ability of polyphosphates to function as antiprecipitating agents.

Generally, the effectiveness of antiprecipitating agents in preventing the precipitation of calcium decreases with increases in the calcium hardness, alkalinity, pH and temperature of the water. Use of excessive amounts of an antiprecipitating agent may cause, rather than prevent, the precipitation of calcium hardness.

One practice used to prevent the formation of calcium carbonate is to adjust the pH value of the water so that the tendency of the water is to be slightly deposit forming with respect to calcium carbonate, and then to add the antiprecipitating agent. Langelier's formula is used to obtain Langelier's Saturation pH value and Index, terms which have been previously discussed.

Use of an Acid

Water that has the tendency to precipitate calcium carbonate can be made non-deposit forming with respect to calcium carbonate by adding acid to convert the bicarbonate present to sulfate, sulfamate, etc. Sufficient acid is added to make the water corrosive instead of deposit forming. A corrosion inhibitor, such as one of those previously discussed, is then added to the water to protect the metals in the system from corrosion.

Algae Growth

Cooling towers and spray ponds provide the environment sought by algae and other microorganisms. Algae grow prolifically in locations where there is moisture or water, sunlight, and warmth. There are many species of algae, the most common of which are the blue-green, grass-green and yellowish-brown. Certain algae, when intermingled, form slime-like masses. Algae growths and masses in a tower can restrict or misdirect the flow of water or air, or both, thereby reducing efficiency.

If algae growths become detached and are carried with circulating cooling water to the equipment to be cooled, and they adhere and die, retardation of heat transfer and restriction of circulation can occur. Furthermore, algae may evolve oxygen, which as previously mentioned, is a depolarizer, and cause localized corrosion, or they may excrete acids which stimulate corrosion of the metals involved.

Bacteria

Bacteria prefer sheltered areas and seek locations such as piping and equipment. Bacteria thrive on dead algae and other organic matter, and in their life process produce foul smelling slimes.

Crenothrix, a form of "iron bacteria," assimilate iron and possibly organic matter during their life cycle. When they die and decay, they produce acidic materials which can cause corrosion, and leave foul smelling iron containing deposits. Such slimes cause the same, or more, severe conditions in equipment as are caused by algae.

Fig. 1. Tower wood benefits from right chemical treatment.

A type of bacteria encountered, especially in the Southwest and West, are the "sulfate reducing" bacteria. These bacteria reduce the sulfate ion to the sulfide ion which causes corrosion.

Fungi Attack

Fungi can attack cooling tower lumber and result in decay of the lumber. The organisms responsible for the attack are airborne species. Fungi normally attack the cellulose part of wood. However, certain type of fungi will act on lignin as well as cellulose.

Attack may originate and continue internally or it may orginate and continue on the surface of the wood. Severe fungi attack may weaken cooling tower lumber to the extent where the decayed lumber will fail. In extreme cases, the tower lumber may be damagd to the extent where parts of the tower will collapse.

The problems caused by algae, bacteria and fungi are sometimes just as, or more severe than the problems caused by corrosion and the presence of deposits.

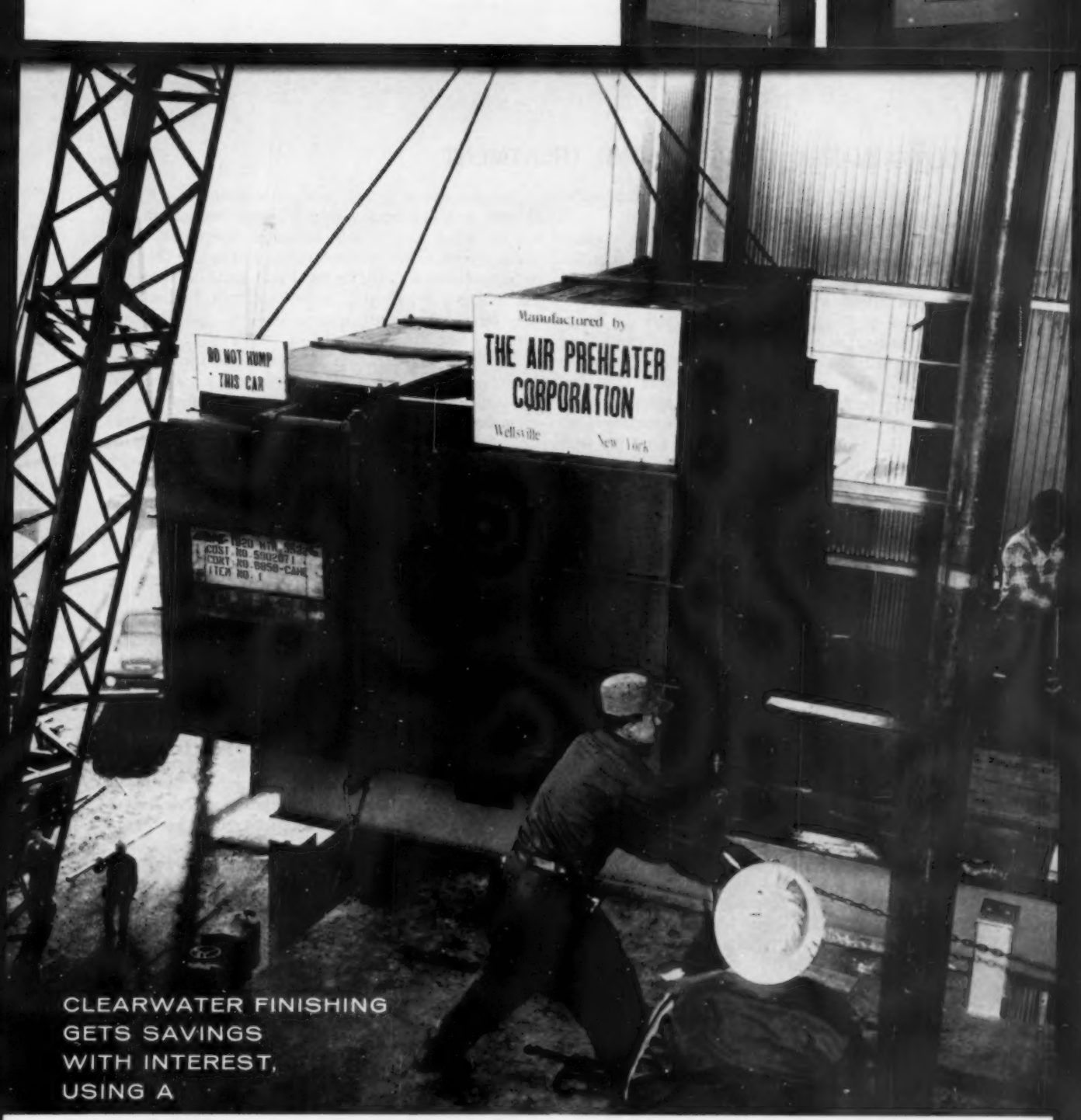
Chemical Attack on Lignin

Lignin is a very important constituent of wood in that it acts as a binder for the cellulose wood cells. Circulating cooling water containing excessive concentrations of the bicarbonate or carbonate ion, or having a high pH value, has the tendency to extract lignin from the wood. If this occurs, then the strength of the cooling tower wood will be affected.

Wood Protection

Today, many cooling towers are constructed of wood that has been treated to resist the action of fungi. One process commonly used is the "double diffusion" process. In this process, the wood is treated with several salts such as zinc or copper salts, arsenates and chromates in such a manner that an insolube salt impregnates the wood. The insoluble salt is toxic to most species of fungi encountered. It is claimed that such a precipitated salt remains in the wood for years.

Cases are on record where cooling towers, constructed of untreated lumber and already in use for years, have undergone attack by fungi and were then treated by a "double diffusion" method as a means of halting the



CLEARWATER FINISHING
GETS SAVINGS
WITH INTEREST,
USING A

PACKAGE AIR PREHEATER

- ***Fuel savings alone pay for it in two years; installation costs cut by pre-assembly — —***

- Savings come in pairs at Clearwater Finishing Co., with the installation of their new Package Air Preheater. This is why:

1. Initial savings on installation. You can install a Package Air Preheater at a fraction of the expense required for conventional heat recovery equipment. The unit you see in the picture is a *complete* Package Air Preheater. To put it into service you simply lift it into place, make power and duct connections. It's that fast, that easy.

2. Long term fuel savings . . . $17,000 a year off your fuel bill (more or less, depending on size of preheater and application). What you save on fuel can pay for the Package Air Preheater within two years.

Installation savings are achieved through standardized design, which permits complete shop assembly. Fuel savings are achieved through the efficient continuous regenerative heat recovery principle, which cuts your fuel bill 1% for each 45-50°F increase in preheated air temperature.

For application ideas, and facts and figures on the potential savings, write for free 14-page booklet.

For more facts circle 575 on Reply Card

Completely pre-assembled Package Air Preheater is lifted into place at the new plant of Clearwater Finishing, (Division of United Merchants & Manufacturers, Inc.) at Clearwater, South Carolina. Installed at far less cost than a unit requiring on-site erection, this Package Air Preheater will serve a 83,000 lb/hr boiler. It measures approximately 8'x8'x6', and its 4900 sq ft of effective heating surface will recover 290°F from the stack gas.

THE AIR PREHEATER CORPORATION

60 East 42nd Street, New York 17, N. Y.
Phone: MUrray Hill 2-8250

COOLING WATER TROUBLES AND TREATMENT

attack. According to the claims, the treatment satisfactorily stopped the attack by fungi for years.

A method recently proposed for treating cooling tower lumber for fungi control involves spraying the wood with an epoxy resin type compound. It is claimed that the compound, when set, seals the surfaces of the wood so that it is not vulnerable to attack by fungi.

Probably the most widely used means of controlling algae, fungi and other microorganism involves the use of chemicals toxic to the organisms. More than one chemical may be required since certain species of certain organisms may not be destroyed by one chemical.

Chlorine or hypochlorites are widely used for control of fungi, algae and bacteria. These chemicals must be used properly since excessive concentrations of chlorine (over 1 ppm) for extended periods of time can result in attack of the lignin in the wood.

The sodium salts of trichlorophenol and pentachlorophenol are used for controlling the growth of microorganisms. Concentrations ranging from 40 to 500 ppm or possibly higher are used, the concentration used depending upon the severity of the problem. Since these compounds are toxic, consideration must be given to a possible waste disposal problem.

Quaternary ammonium compounds are sometimes used as a treatment. Concentrations ranging from 2 to 6 ppm or sometimes more, are used. Use of excessive concentrations may cause foaming since many quaternaries are wetting agents. There are many other inorganic and organic compounds that can be used as fungi, algae and bacteria destroying agents.

Periodic Examination Needed

It has been found that economy-wise and result-wise, best results are obtained with these treatments when they are slug fed.

The effectiveness of the chemical or chemicals used for fungi, algae and bacteria control can be determined by periodically examining samples of cooling tower wood and cooling water for living organisms. Special precautions must be taken in obtaining such samples since, if they are contaminated, the results of the examination may be improperly interpreted.

It has been previously pointed out that the factors responsible for the type of attack classified as delignification are believed to be: excessive carbonate, bicarbonate and chlorine concentrations, high pH and lignin-destroying fungi.

Excessive carbonate, bicarbonate and pH value of the cooling water are prevented by acid treatment or by bleeding off the system. Excessive concentrations of chlorine are prevented by regulating the application of chlorine when it is used as a microorganism destroying agent.

Chlorinating intermittently rather than continuously has the advantage of supplying a shock treatment and lessens the times of contact of chlorine treated water with cooling tower lumber. The fact that chlorine is lost when chlorine treated cooling water passes through a cooling tower may have some bearing on the problem.

One practice is to add sufficient chlorine or a hypochlorite to build up a 1 ppm chlorine residual in the cooling water leaving heat exchange equipment. Generally several hours are required in adding the chlorine or hypochlorite to build up the 1 ppm residual. Depending upon the effectiveness of the treatment, chlorination may be required only once a day, or possibly only several times a week.

Attack of cooling tower lumber due to the presence of excessive concentrations of dissolved or suspended solids is prevented by limiting the concentrations of these constituents to reasonable values. The concentration of dissolved solids is regulated by adequately bleeding off the system. The use of baffles or screens or both near the cooling water outlet in the basin of a cooling tower with a suitable means of removing accumulated solids helps to keep suspended solids to low values.

Feeding of Chemicals

Feeding equipment ranging from simple educting apparatus to complicated proportioning systems can be used for continuous treatment. Generally, controlled volume chemical feed pumps are used for feeding treating solutions. Cast iron, stainless steel and plastic feeding equipment are available. The type needed depends upon the treatment to be fed.

Chemical feed tanks lined with a protective coating are available for handling corrosive solutions. Suitable inexpensive relief or back pressure valves and motor starters are available for the purposes intended. Generally, corrosion inhibitors, antiprecipitating agents and acid are fed continuously to a system. Algicides, fungicides and bactericides are usually, but not always, fed intermittently.

Simple colorimetric or titration tests are used to test water samples, to determine whether or not the control ranges set are being maintained. The amounts of chemicals added and the rate of bleedoff of concentrated cooling water are adjusted as required to maintain the set control ranges or tolerances.

Corrosion test specimens may be installed in cooling systems to follow the progress of inhibitors in preventing corrosion of the type of metal specimens installed. A sufficient number of specimens are cleaned, preweighed, and installed at the desired locations, and a pair removed at predetermined intervals over a period of time.

The specimens, after removal, are inspected, cleaned, reweighed and examined with a microscope. The rate of corrosion is then calculated and expressed in some term such as mils per year. The extent and severity of localized corrosion are determined and expressed in some usable term.

Other means are used for following the progress of inhibitors in preventing corrosion. These include electrical means and use of removable bypasses.

Obviously, the best means of determining the effectiveness of chemical treatment in preventing corrosion, scale, fungi, algae and other microorganisms, is to inspect the equipment. However, this is not always possible. **End**

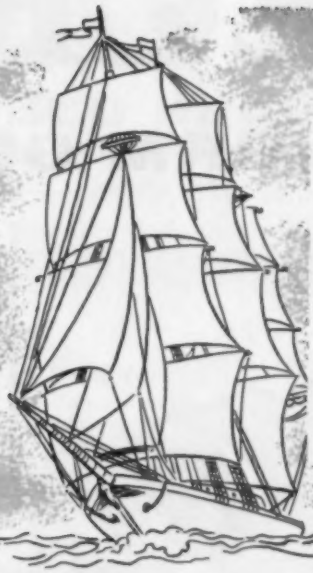
connections. It's that fast, that easy.

for free 14-page booklet.

For more facts circle 575 on Reply Card

Why Rust-Oleum is different—

and what this difference, backed by 35 years of industry proof, means to you!



A Sea Captain developed it . . . Industry proved it!

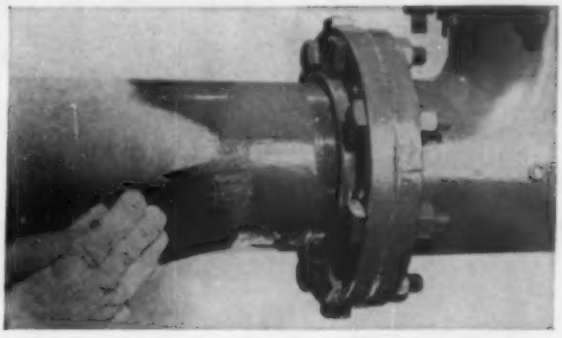
The original Rust-Oleum formula was developed nearly fifty years ago by Sea Captain Robert Fergusson, who became intrigued with the rust-stopping qualities of fish oil early in his career. Creating a *special treatment* for the fish oil, he used the *specially-processed fish oil* as the vehicle in combination with fine rust-inhibiting pigments. The result? A coating that actually *stopped rust* when applied directly over sound rusted surfaces, after scraping and wirebrushing to remove rust scale and loose rust. Possible, because the *specially-processed* fish oil penetrated the rust to bare metal. This was the birth of Rust-Oleum's *exclusive* 769 Damp-Proof Red Primer.

PROVED THROUGHOUT INDUSTRY FOR OVER 35 YEARS

Today, Rust-Oleum in its many systems and colors, has been proved throughout industry for over thirty-five years. This proof by leading industrial users is your assurance of savings in time, money, and metal. Economies made possible by the fact that Rust-Oleum 769 Damp-Proof Red Primer goes right over the sound rusted metal—usually eliminating costly surface preparations. And Rust-Oleum, in its various systems, resists rain, sun, fumes, heat, weathering, chemicals, etc., for lasting beauty over the years.

RUST-OLEUM NEW COLOR HORIZONS SYSTEM

The Rust-Oleum New Color Horizons System introduces a new coating concept to industry. It combines four important factors: (1) the ability to stop rust, (2) smart, modern color harmony, (3) the durability to last and last, (4) ease of application that saves time, money, and metal. See how this system can bring lasting beauty to your plant, machinery, equipment, pipes, tanks, structural steel, fences, etc. Write for complete information or contact your nearby Rust-Oleum Industrial Distributor. He maintains complete stocks for prompt service.



RUST-OLEUM®

There are imitations, but only *one* Rust-Oleum. It is distinctive as your own fingerprint.

STOPS RUST!®

ATTACH TO YOUR LETTERHEAD

Rust-Oleum Corporation
2522 Oakton St., Evanston, Illinois

Please send me the following at no cost or obligation:

- ☐ New Color Horizons Systems Catalog featuring 110 actual color standards and 69 photo applications.
- ☐ Free test sample of Rust-Oleum 769 Damp-Proof Red Primer to be applied over sound rusted surface.
- ☐ Results of radioactive tracing study on Rust-Oleum fish oil penetration.

For more facts circle 576 on Reply Card

DELROYD

WORM GEAR SETS

Check these advantages:

- Involute helicoid thread form (strongest thread form made)
- Centrifugally cast gears
- More horsepower per dollar

Delroyd units are manufactured in a modern plant devoted specifically to the production of worm gearing—a plant which has one of the largest thread milling and thread grinding capacities in the United States. Because we use this exclusive precision machinery, the most exacting testing techniques and highly skilled workmanship, you are assured of quality and service associated with the leading specialists in worm gearing.

Delroyd provides the widest range of sizes and ratios, and offers complete interchangeability of parts. Whether you specify worm gear sets or worm gear speed reducers, you are assured of the finest quality obtainable.

DE LAVAL *Steam Turbine Company*

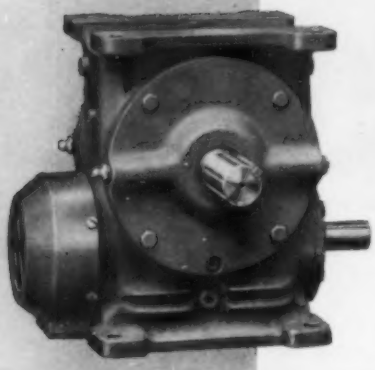
916 NOTTINGHAM WAY, TRENTON 2, N. J.

DELROYD

WORM GEAR SPEED REDUCERS

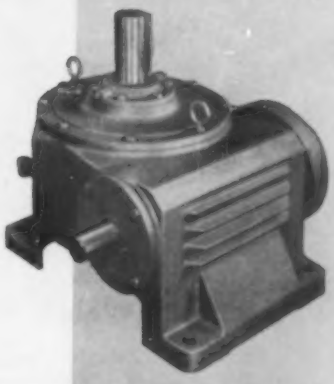
FAN COOLED RIBBED CASES

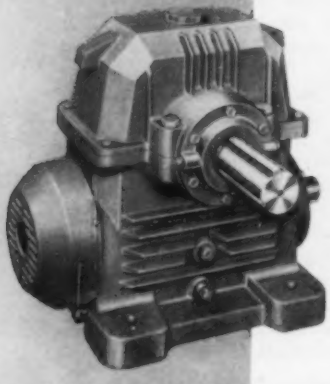
Widest range of ratings available—from .05 HP, 1⅛" center distance to 1050 HP, 36" center distance—in single and double reduction units



TYPE D
Verso Unit
Adapts to any mounting requirement
Ratios:
5:1 to 70:1
Horsepowers:
.062 to 13.5
Center distance:
2½" to 4"

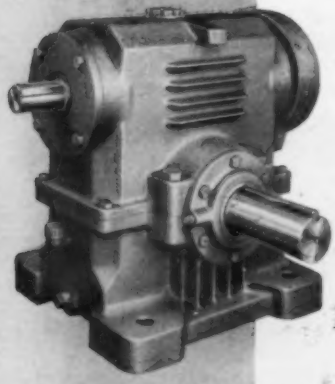
TYPE V
Vertical single reduction
Shaft up or down
Ratios:
5:1 to 70:1
Horsepowers:
.062 to 150
Center distance:
5" to 12"





TYPE B
Horizontal single reduction
Bottom drive
Ratios:
5:1 to 70:1
Horsepowers:
.062 to 150
Center distance:
5" to 12"

TYPE HB
Horizontal helical-worm
Right angle drive
Ratios:
15:1 to 355:1
Output torque:
2460 in. lbs. to 135000 in. lbs.
Center distance:
3½" to 12"



TYPE T
Horizontal single reduction
Top drive
Ratios:
5:1 to 70:1
Horsepowers:
.062 to 150
Center distance:
5" to 12"

TYPE DB
Horizontal double-worm
Parallel input and output shafts
Ratios:
75:1 to 4900:1
Output torque:
4170 in. lbs. to 135000 in. lbs.
Center distance:
3½" to 12"

Prompt delivery from stock—all units through 12 inch center distance

DE LAVAL *Steam Turbine Company*

916 NOTTINGHAM WAY, TRENTON 2, N. J.

For more facts circle 577 on Reply Card

DL-638

Change hats with your

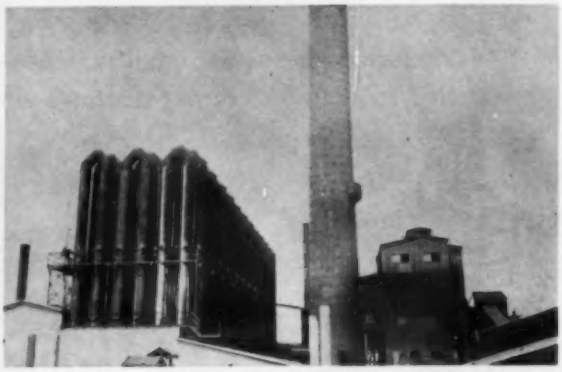
SAFETY YOU CAN SEE

Glass Cloth Filter Bags Scavenge Hot Gases at Copper Smelter

INSTALLED AT the Hudson Bay Mining and Smelting Co., Ltd., Flin Flon, Manitoba, a 120-compartment glass-bag filter handles 450,000 cfm of reverberatory furnace and converter gases. The system consists of 12 ten-compartment filters with a normal daily collection in excess of 35 tons. This installation marks the first successful large-scale use of a glass cloth filter as a process tool.

At Hudson Bay, 800 F gases are blown from an electrostatic precipitator, which receives the reverberatory and converter exhaust, to a series of cooling tubes where the temperature is reduced to 450 F. This is a full 150 degrees less than the maximum advisable temperature for the filter.

A major life-extending factor for the bags in this installation is the Swing-Clean bag cleaning mechanism, a device built and installed by the Dracco Div., Fuller Co. Imparting an oscillating motion to the top of the filter bags, it is part of a fully-automated cleaning cycle program which systematically cuts each compartment off stream from the other filter compartments for cleaning. A series of air-operated valves are automatically opened and closed for reverse air cleaning.



Composite Welder Produces Bigger, Better Buttwelded Dies

PRODUCING LOW-COST, quality tools, a new composite welding machine is in operation at Allegheny Ludlum Steel Corporation's Forging and Casting Division. It can weld an area of 150 sq in. in seconds.

The weld joins expensive tool steel alloys to less costly mild steel to form a composite die section. The expensive alloy is used only on the working or cutting edge of the die.

The tool steel is usually cut or shaped to the desired design prior to welding, with the result that less tool steel is used and less work is required to machine the die into shape.

Handling shapes up to 15 in. high and 18 in. long, the new composite welder replaced a machine that would weld a maximum of 60 sq in. It combines extreme heat and intense pressure to electrically buttweld the two metals together. The two pieces, red hot when welded, leave little trace of the welded seam after cooling. Up to 1600 psi of offset pressure is applied, and the machine has a heat power supply of 750 kva.

Range of sizes and shapes of composite dies is almost limitless. Special shapes with cutting edges of water hardening, oil hardening or shock-resisting tool steel can be manufactured promptly to specification.

Hypersonic Wind Tunnel Nozzles Plated On, Shrunk Off, Aluminum Mandrels

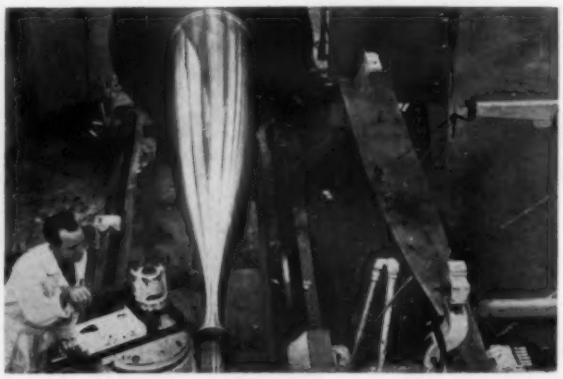
TO SIMULATE rocket-powered flight, Douglas Aircraft Co. will soon blast air through a trio of jet nozzles into a testing chamber at speeds ranging from 4500 mph (Mach 6) to 7600 mph (Mach 10)). The first of three precisely-shaped nickel shells, used as heat-resistant liners to protect the nozzles projecting the tremendous air blast, has been formed by Douglas.

Manufacture of the part required an aluminum hand forging weighing 8230 lb to serve as a core, or mandrel, for the nickel coating that ultimately became the liner.

The aluminum part was forged by Aluminum Co. of America from an ingot measuring 36½ in. in diameter and 78 in. in length.

Douglas finish-machined the 12-ft-long mandrel, tapering it from 24 in. at one end to 3 in. at the other. A cut was made that severed the small end of the mandrel. It was rejoined by bolting it to the larger part. A special electroforming operation deposited just over ⅝-in. thickness of nickel on the mandrel surface.

The mandrel-liner assembly was exposed to sub-zero temperatures, and the aluminum mandrel "shrank" away from the nickel coating on its exterior. The bolt was then removed and the two mandrel sections withdrawn, leaving the liner ready for installation in the wind tunnel.

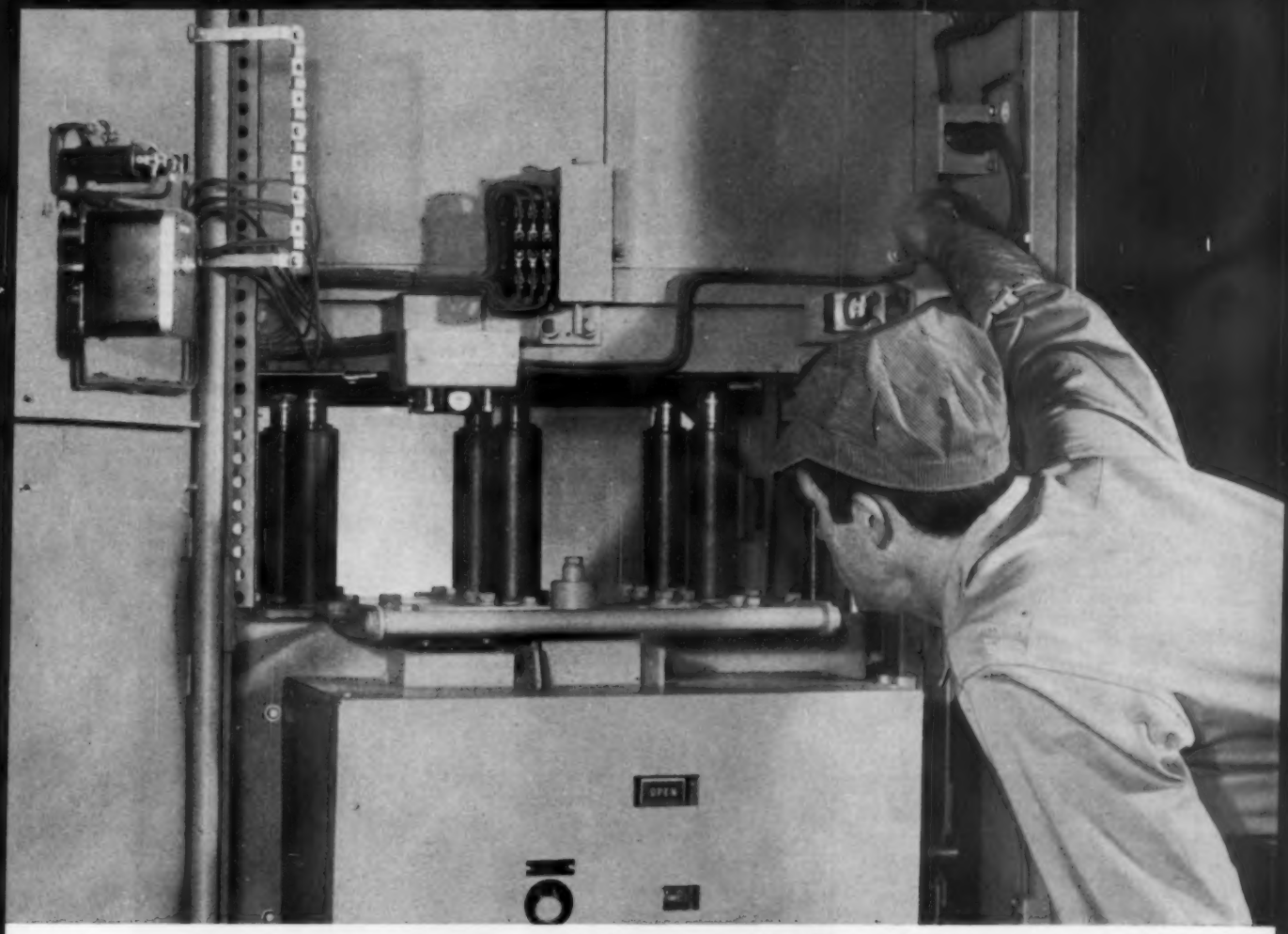


For more facts circle 577 on Reply Card

DL420

Change hats with your maintenance man, he will demonstrate . . .

SAFETY YOU CAN SEE



Only General Electric *Vertical Lift* Metal-clad Switchgear lets you see when it's disconnected

When your maintenance man operates General Electric Vertical Lift Metal-clad switchgear he can *see* when the primary disconnects are parted. He knows the breaker is safely open—a really important safety factor when he's working with thousands of volts of electricity.

General Electric Vertical Lift is the only switchgear design which gives you this safety bonus. Allowing your operator to visually check also reduces the possibility of outages which damage equipment and halt production.

Safety you can see is another reason why General Electric manufactures Vertical Lift design Metal-clad switchgear.

Contact your General Electric switchgear representative for more information, or write for Metal-clad bulletin, GEA-5664, to Section 511-37, General Electric Company, Schenectady 5, New York.

VERTICAL LIFT'S 3 STEPS TO SWITCHGEAR SUPERIORITY:

STEP 1: (Illustrated) Disconnect breakers automatically—only Vertical Lift design permits operator to actually see when disconnects are parted.

STEP 2: Remove breaker, slide out box barrier—Vertical Lift design allows operator to inspect contacts without moving arc chutes.

STEP 3: Remove protective cover—only Vertical Lift Metal-clad has the breaker operating mechanism up front for easy access.

Progress Is Our Most Important Product

GENERAL ELECTRIC

For more facts circle 578 on Reply Card

NEW PLANT CONSTRUCTION —advance information on location, costs

Crossett, Ark.—The Crossett Company, Division of Crossett Lumber Co., is constructing a medium-density flakeboard plant adjacent to company's existing facilities here. New plant will consume 38,000 cords of wood per year and produce about 100 tons of flakeboard daily. Completion target for the facility is scheduled for the summer of 1961 and will represent an investment of $6 million. Ford, Bacon & Davis, Inc., are designers of the plant.

Fort Smith, Ark.—Eagle-Picher Company, 1956 American Building, Cincinnati, O., plans to construct a plant here for its Ohio Rubber Company Division. The new plant, slated for completion early next year, will manufacture automobile floor mats and molded precision rubber parts. Plant design will also include facilities for the production of semi-pneumatic tires for industrial, agricultural and other equipment. Plant will cost approximately $3 million.

Los Angeles, Calif.—Witco Chemical Co., 122 E. 42nd St., New York, N. Y., revealed plans for joining the Richfield Oil Corp., Los Angeles, Calif., to form Whitfield Chemical Corp., which will build a $1.75-million dodecylbenzene plant, adjacent to the Watson refinery of Richfield Oil Corp. plant located here. Work is expected to begin soon for completion next year.

Naugatuck, Conn.—United States Rubber Co., 1232 Avenue of the Americas, New York 20, N. Y., plans to construct a technical center for company's Naugatuck Chemical Division, near company's main plant located here, for the purpose of expanding research activities and speeding up technical services for customers. Construction will get under way by this summer with completion slated for 1961. The center will have 37,500 sq ft floor space.

Waterbury, Conn.—Chase Brass & Copper Company, a Kennecott Copper Corp. subsidiary, 1949 Rodney Street, this city, plans to construct a tube mill at company's metal works located here. The installation is already under way and is expected to be completed later this year at a cost of about $2 million.

East Tampa, Fla.—The Tennessee Corporation, Grant Building, Atlanta, Ga., has authorized an expenditure of $13 million for the construction of an ammonia plant and to expand two existing facilities. The 100,000 ton-per-year ammonia plant is scheduled to go on stream in early 1962 at a cost of approximately $11 million.

Miami, Fla.—American Marc, Inc., Inglewood, Calif., plans to construct a marine division plant and showroom for the manufacture and sale of glass fiber boats. Work on the new facility has already begun and is expected to be in production by the summer of this year. New plant will produce 6500 boats a year. Plant will cost about $500,000.

Tampa, Fla.—Continental Can Company, 100 E. 42nd St., New York, 17, N. Y., plans major expansion of company's facilities located here. Work on the new addition which will cover 120,000 sq ft is already under way and is scheduled for completion by the summer of 1961. Expansion will cost about $1 million.

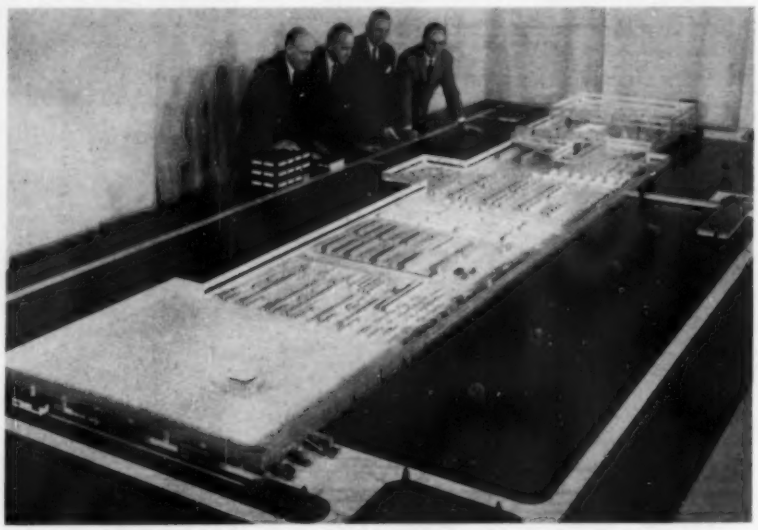
Port St. Joe, Fla.—Florida Gulf Fibre Company plans to construct a semi-chemical corrugating medium paper mill on large tract of land here. The new facility will have a daily capacity of 450 tons of corrugating medium and its initial production is scheduled to begin in 1961. The plant will represent an investment of $13.5 million.

Augusta, Ga.—Deerfield Glassine Co., Inc., Monroe Bridge, Mass., plans to construct a large glassine paper mill on building site recently acquired near here. Work on the new facility is now under way and is scheduled for completion early in 1961.

Cartersville, Ga.—Goodyear Tire & Rubber Company, 1144 E. Market St., Akron, O., plans major expansion program at local plant here. New addition will be used for expansion of company's tire fabric production. Work on the new addition will begin at once and is scheduled to go into production by the fall of 1961.

Chicago, Ill.—Pfaelzer Brothers, division of Armour & Co., Chicago, Ill., plans to construct a large meat processing plant here. Plans call for the construction of a 75,000-sq ft concrete and steel structure on a six-acre tract. Construction of the new facility is already under way and is scheduled for completion by January 1961.

Fort Wayne, Ind.—B. F. Goodrich Company, 500 S. Main Street, Akron, O., plans to construct a multi-million dollar tire manufacturing plant. It will be erected on a 350-acre site on the banks of the Maumee River, east of New Haven, Ind., on U. S. Route 24.



B. F. Goodrich Company executives inspect scale model of the multi-million-dollar tire manufacturing plant which will be built near Fort Wayne, Indiana.

Work on the new plant will begin at once and will have a floor area of 850,000 sq ft devoted to the production of most types of passenger car tires, truck and farm implement tires, and other company products. Plant will be completed by June of 1961.

Hartford City, Ind.—Minnesota Mining & Manufacturing Company, 1000 Fauquier Ave., St. Paul, Minn., plans major addition to company's duplicating products manufacturing plant located here, expanding plant capacity by more than 60 per cent.

Baton Rouge, La.—Copolymer Rubber & Chemical Company, this city, plans to increase its butadiene production

(Continued on page 287)

WEATHERHEAD

offers one source for all tube fitting needs... a complete line of flared, flareless or pipe...

TUBE FITTINGS of BRASS, CARBON or STAINLESS STEEL

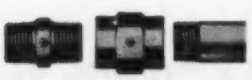
BRASS FITTINGS

S.A.E. 45° FLARE
USED with copper, brass, aluminum, steel and plastic tubing. PRESSURE RATINGS up to 5000 p.s.i. **Sizes: ⅛" to ¾".** Also available in 37° heavy pattern brass. Listed by U.L.; approved by A.G.A. Meets specs of S.A.E. Hydraulic Tube Fittings Standards and A.S.A. and A.S.M.E. codes for instruments and control piping.

COMPRESSION
USED with copper, brass, aluminum and plastic tubing. PRESSURE RATINGS up to 2000 p.s.i. **Sizes: ⅛" to ¾".** Listed by U.L.; approved by A.G.A. Meets specs of S.A.E. Hydraulic Tube Fittings Standards and A.S.A. and A.S.M.E. codes for instruments and control piping.

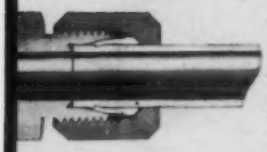
SELF-ALIGN®
No flaring, soldering, welding—insert tube and tighten nut. USED with copper, brass, aluminum and plastic tubing. PRESSURE RATINGS up to 2000 p.s.i. **Sizes: ⅛" to ¾".**

INVERTED FLARE
USED with copper, brass, aluminum, steel, Bundyweld and plastic tubing. PRESSURE RATINGS up to 3000 p.s.i. **Sizes: ⅛" to ¾".** Listed by U.L. Meets specs of S.A.E. Hydraulic Tube Fittings and A.S.A. and A.S.M.E. codes for instruments and control piping.

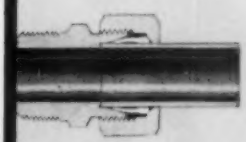


PIPE
USED with brass or steel pipe. PRESSURE RATING: up to 5000 p.s.i. **Sizes: to 2".** Meets specifications of S.A.E. TPHL Fittings Committee.

FORGED STEEL FITTINGS

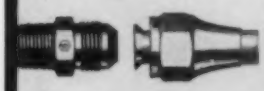


"7000" SERIES ERMETO®
U.L. listed. Meets J.I.C. standards. S.A.E. approved "O" Ring boss design. Dryseal pipe thread. Needs no flaring. Available in either carbon or stainless steel. Carbon steel fittings have "Weathercoat" or cadmium-plate finish. PRESSURE RATINGS: up to 10,000 p.s.i. **Size Ranges—⅛" through 2".**



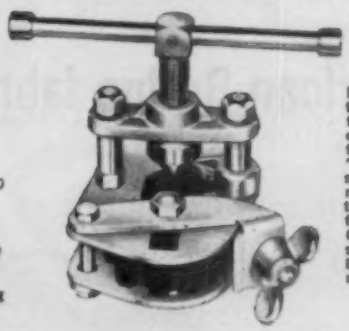
"9000" SERIES ERMETO®
Listed by U.L. for use with hazardous liquids, fuel equipment, refrigeration and gas; meets specs of S.A.E. and J.I.C. hydraulic tube fitting standards. Supplied as standard in cadmium-plated carbon steel and in stainless steel. Requires no flaring. PRESSURE RATINGS: up to 10,000 p.s.i. **Size Range—⅛" through 2".**

FLARE-TWIN—(2-pc. or 3-pc.)
37° FLARE STEEL TUBE FITTINGS
Listed by U.L., S.A.E. and J.I.C. approved. Used with J.I.C. and other soft steel tubing; also with copper, aluminum, and fully annealed stainless steel tubing. Meets S.A.E. standards for straight thread boss mounting. PRESSURE RATINGS up to 10,000 p.s.i. **Sizes: ⅛" through 2".**



FLARE-TWIN
Made in 3-piece and 2-piece assemblies. 2-piece type offers price advantage. "Weathercote" or cadmium-plate finish.

FAST! EASY! ACCURATE TUBE WORKING TOOLS



New rotary flaring tool for perfect tube flaring. Fast . . . one piece construction. Easier . . . "Dial - Matic" tube size selection. Accurate...tube stop automatically controls flaring diameter. Compact . . . easy to store. Available with burnishing attachment.

Spring-Type Bender | Mechanical Bender | Tube Cutter | Bar-Type Flaring | Tube Swaging | Automatic Flaring Rotary

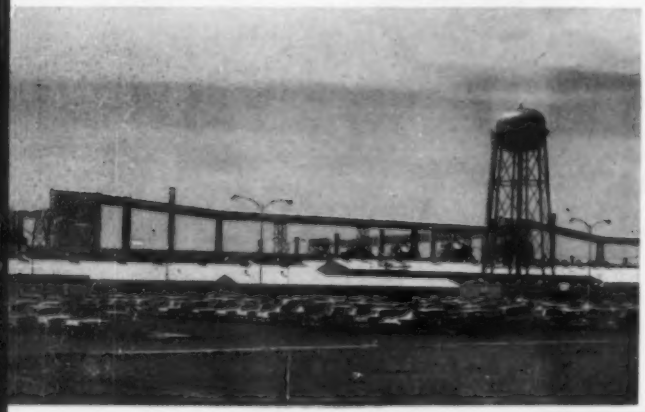
THE WEATHERHEAD COMPANY

FORT WAYNE DIVISION • Dept. PL-5, 128 West Washington Blvd.
Fort Wayne, Indiana

FOR DETAILS
See Weatherhead catalog in Sweet's Product Design File, Plant Engineering File, the Fluid Power Directory, or write direct.

For more facts circle 579 on Reply Card

USS American Bridge fabricates and erects 30,000 tons

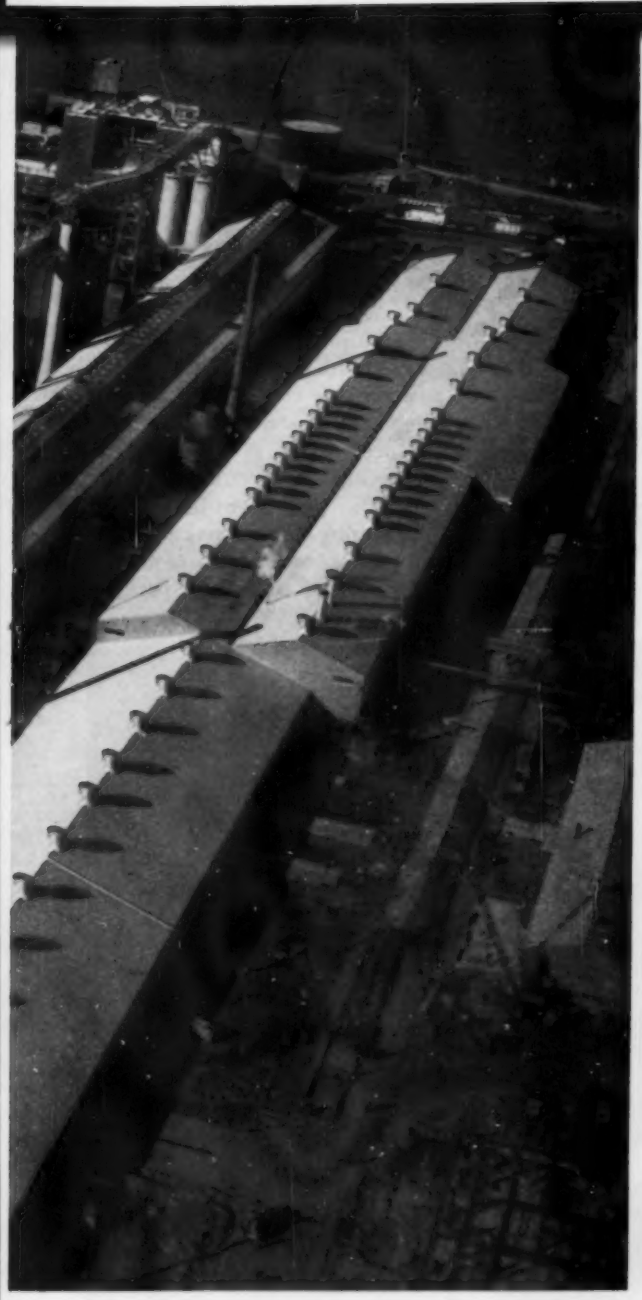


This is Reynolds Metals Company's new aluminum reduction plant at Massena, New York. American Bridge Division of United States Steel fabricated all of the steelwork and erected all buildings, tanks, conveyers and stacks.

It was a big job . . . completed on schedule.

Have any industrial construction coming up? Contact the nearest American Bridge office in any of the cities listed on the following page.

USS is a registered trademark



# of steelwork for giant new industrial plant

Here are dimensions of some of the major installations:

. . . 111' x 934' metal service building, with 20'6" x 400' lean-to.
. . . Six pot room buildings, each 63' x 1,315', one story, with crane runway.
. . . 90' x 505' machine shop.
. . . Detanking building, 41' x 80', 55' high.
. . . Four storage tanks, 16' dia. x 48' high.
. . . Two storage tanks, 46' dia. x 48' high.
. . . Eight storage tanks, 50' dia. x 33'3" high on 45' towers.
. . . Fourteen fume stacks 8'6" dia. x 110' high with conical base.

USS **American Bridge Division of United States Steel**

General Offices: 525 William Penn Place, Pittsburgh, Pa.
Contracting Offices in: Ambridge • Atlanta • Baltimore • Birmingham • Boston • Chicago Cincinnati • Cleveland • Dallas • Denver • Detroit • Elmira • Gary • Harrisburg, Pa. Houston • Los Angeles • Memphis • Minneapolis • New York • Orange, Texas Philadelphia • Pittsburgh • Portland, Ore. • Roanoke • St. Louis • San Francisco • Trenton United States Steel Export Company, New York

For more facts circle 580 on Reply Card

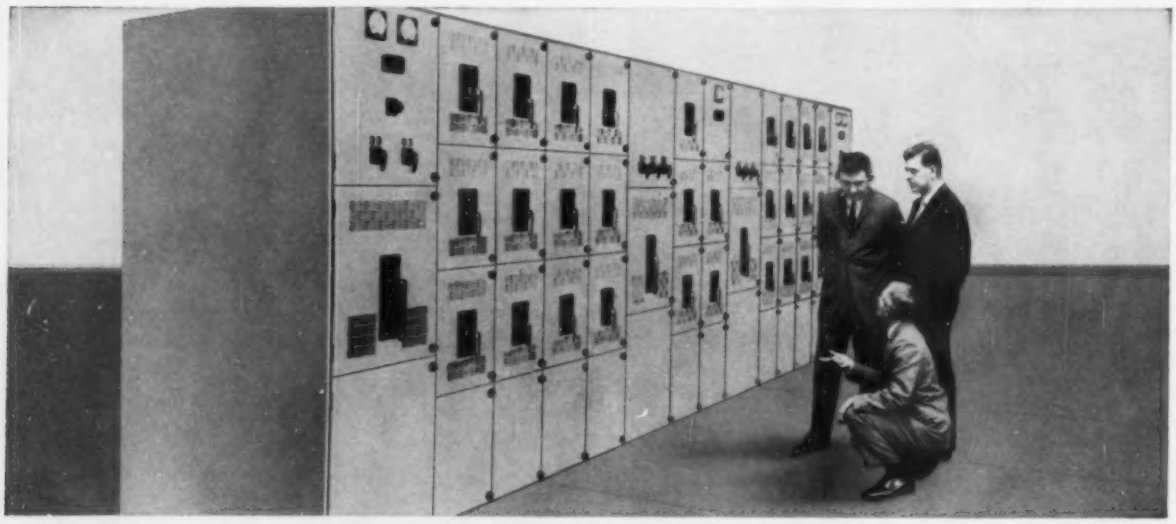
Maximum Value in Switchgear Flexibility... Safety...

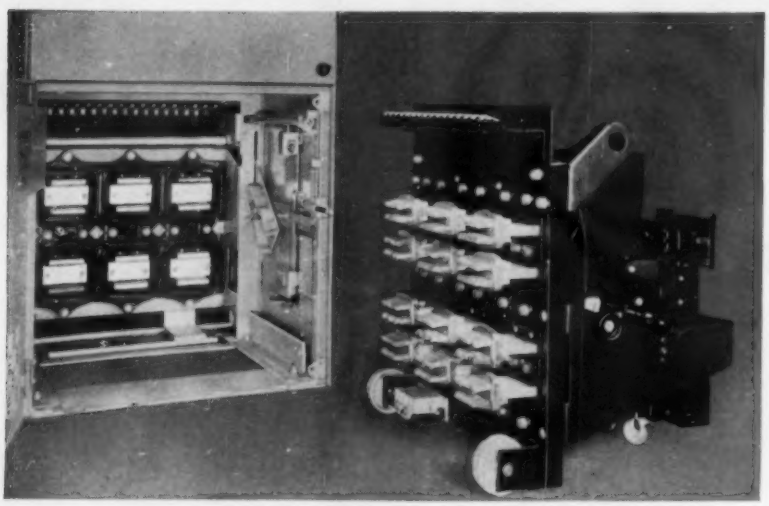
Westinghouse low-voltage, metal-enclosed switchgear is modern inside and out . . . loaded with features to assure you of a high return on your investment.

Absolute mechanical and electrical integrity is guaranteed with 100% use of Westinghouse components. Design performance is thoroughly proved in exhaustive tests at the Westinghouse High Power Laboratory.

Minimum cost is possible by specifying "Standardized" over-all design. Westinghouse "Standardized" switchgear meets all normal requirements within its rated interrupting capacity . . . eliminates additional engineering and manufacturing costs of expensive "specials."

Nationwide switchgear manufacturing plants are ready to serve you . . . convenient for consultation and inspection during equipment construction. All units are thoroughly tested for conformity to NEMA standards. Where conditions permit,





Cluster-Type Disconnect Fingers permit quick inspection when breaker is withdrawn from cell. A spring-mounted floating retainer maintains full contact pressure and assures maximum current rating capacity despite minor variations in breaker alignment.

Glass Polyester Bus Supports and Short Circuit Bracing . . . provide ideal physical and electrical properties for low-voltage, metal-enclosed switchgear. The insulation is highly track resistant and flame retardant. Design of supports and bracing affords increased vertical creepage distances. Result: maximum safety with minimum maintenance.

Long-Term Operating Economy

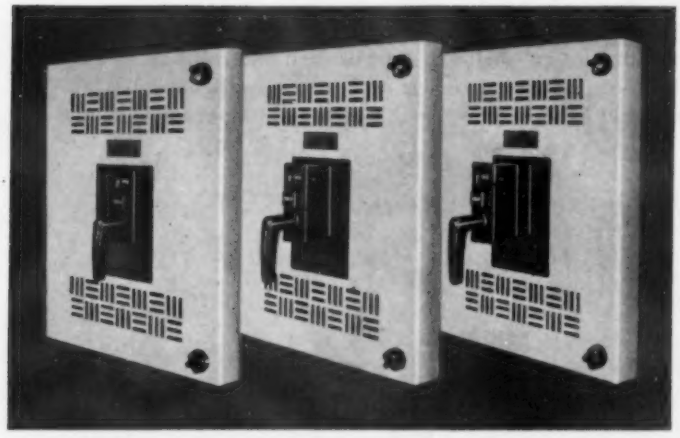
switchgear is shipped as one completely assembled apparatus.

And, mighty important . . . *Westinghouse assumes complete, undivided responsibility for the switchgear* from planning to the satisfactory overall operation of the installed equipment. For detailed information on low-voltage, metal-enclosed switchgear, call your Westinghouse sales engineer, or write: Westinghouse Electric Corporation, P.O. Box 868, Pittsburgh 30, Pennsylvania.

J-60894-B

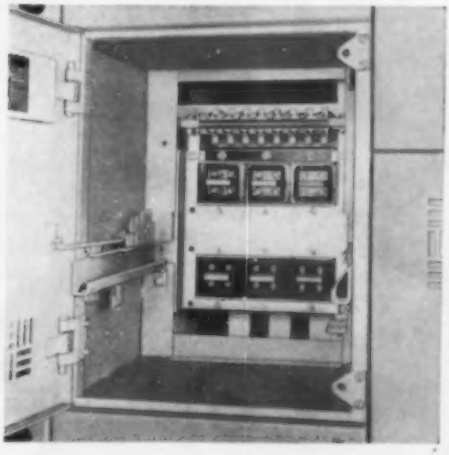
YOU CAN BE SURE...IF IT'S Westinghouse

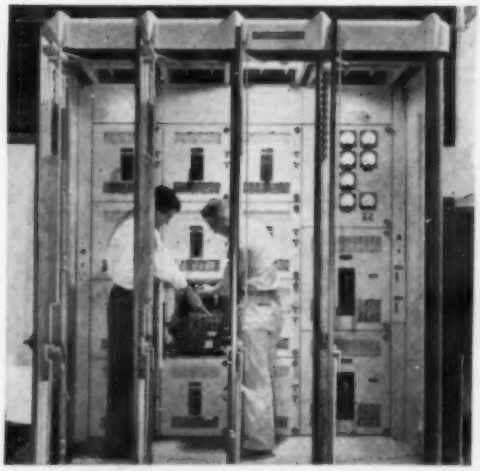
WATCH "WESTINGHOUSE LUCILLE BALL-DESI ARNAZ SHOWS" CBS TV ALTERNATE FRIDAYS



Three-Position Drawout Design permits the De-ion® type DB breakers to be in "connected"—"test"—or "disconnected" position with the breaker door closed. The breaker can be tested in complete safety and storage space for the breaker is also provided when in fully disconnected position.

Individual Breaker Compartments include interlocks and positioning devices to assure safe removal or replacement of breakers. Dead-front design provides maximum protection and safety for operators and equipment.





"Walk-In" Aisle provides protected work space in outdoor units. Addition of this space to the weatherproof, functional design permits easy inspection and maintenance without exposure of equipment or personnel under all weather conditions.

Three Breaker Closing Mechanisms are available to match your requirements—dependent manual, independent manual, or electric—for DB-15, DB-25 and DB-50 breakers. NEMA standards specify electric mechanism for closing DB-75 and DB-100 breakers. The independent manual mechanism, shown below, assures uniform breaker operation—regardless of operator's motion—prevents delayed closing and excessive contact burning.

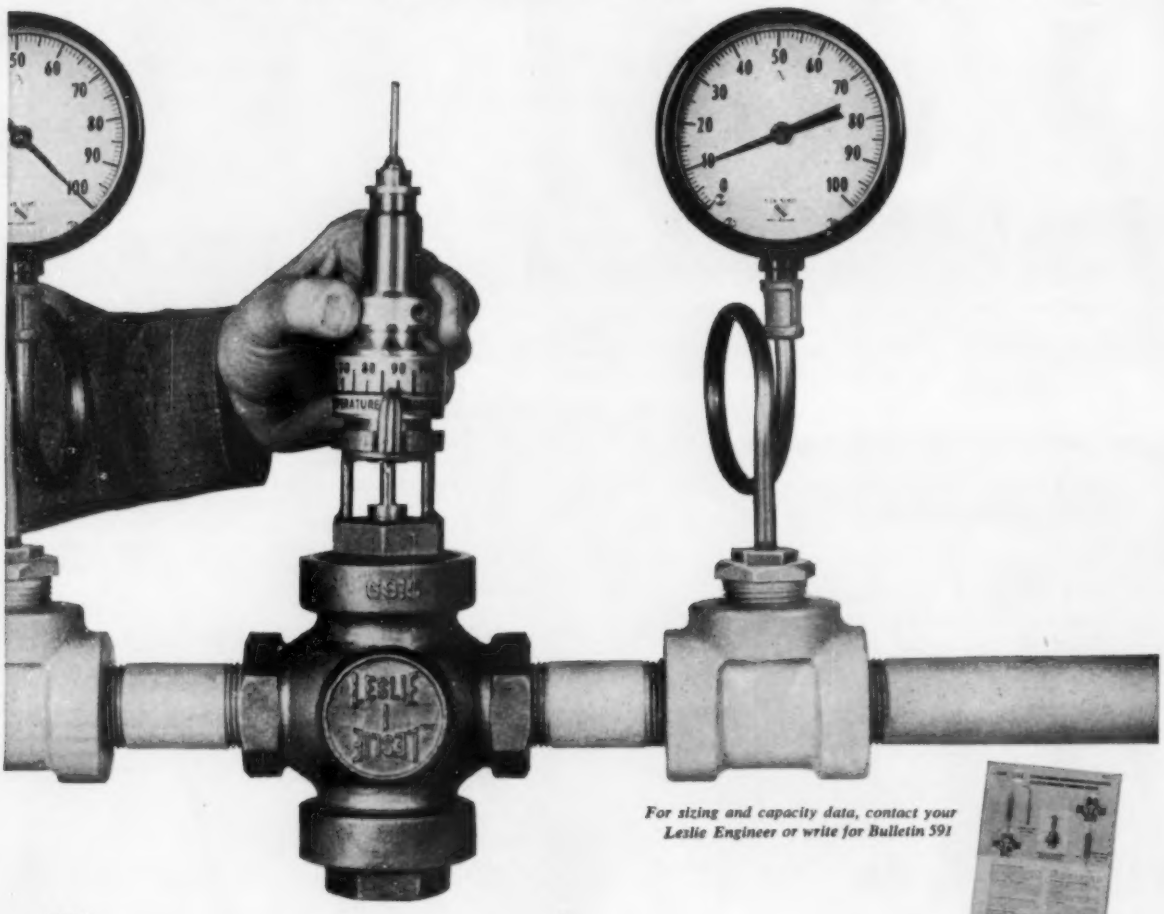
accuracy, reliability
ENGINEERED INTO LESLIE'S COMPLETE

NEW SINGLE-SEATED, BALANCED DISC, TEMPERATURE REGULATOR HANDLES INLET PRESSURES TO 100 psi.

New Leslie regulator can handle inlet pressure and pressure drops to 100 psi. High power, positive movement of an actuating bellows with solid liquid fill, and the virtually friction-less stuffing box provides stem movement exactly proportional to the temperature change at the bulb.

Designed for steam or water service, it features a single seated, self-aligning, tight closing inner valve. (Units can be changed in the field from direct to reverse acting, or from reverse to direct acting, simply by inverting body and main valve.)

Applications include instantaneous heaters or coolers—shell and tube or shell and coil heat exchangers; storage or tank heaters; and, process heaters or coolers of all types. Available in cast iron or cast bronze bodies for temperatures to 450°F. Sizes ¾ and 1", screwed connections.

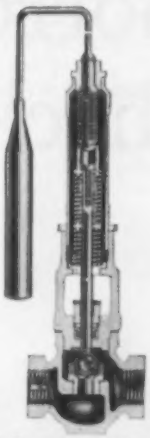


For sizing and capacity data, contact your Leslie Engineer or write for Bulletin 591

LC-10

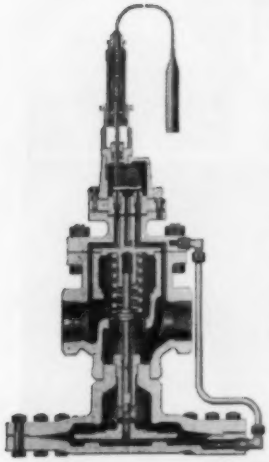
LINE OF TEMPERATURE REGULATORS.

OTHER VERSATILE LESLIE REGULATORS PROVIDE PRECISE TEMPERATURE AND PRESSURE CONTROL.



Bellows Operated Temperature Regulator For Small Flows

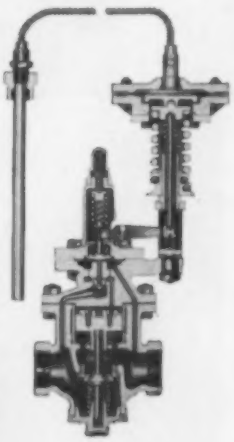
Direct Operated Design is used for small flow heating and cooling service, size ⅜, ½ and ¾". Liquid filled thermostatic element supplies ample power to stroke the single seated main valve. Valve travel is directly proportional to temperature change at bulb. This design is suitable for instantaneous and storage type heaters. It is also available in double seated construction for cooling service.



Class TKM Pilot Actuated, Metal Diaphragm Operated Temperature Regulator

Pilot Operated, Single Element Control also uses the liquid filled element to operate pilot device which applies operating pressure from the regulator inlet to a diaphragm for stroking main valve in heating or cooling service. Large diaphragm area and operating pressure supply ample power for controlling long stroke, single seated main valve with full flow capacity in sizes ½-4". Regulator has a 3 to 5° throttling range and is suitable for all storage type heat exchangers and for any system requiring on-off control.

Class LTCO Pilot Actuated, Piston Operated Temperature Regulator



Pilot Operated, Duo-Matic (two-element control) design offers both temperature and pressure regulating functions in a pilot actuated, piston or diaphragm operated regulator. The valves can handle a range of inlet steam pressures in heating services from 25 to 600 psi and controlled pressure ranges of either 2 to 15 psi or 10 to 250 psi. These characteristics are ideal for all storage type heaters and most instantaneous heater problems. Available in sizes ¼-6" with iron, bronze and cast steel construction.

For complete sizing and capacity data, write for Bulletin 5307-A.

TRADE LESLIE MARK

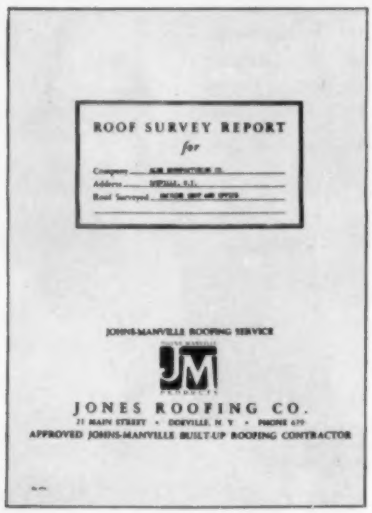
REGULATORS and CONTROLLERS
Leslie Co., 707A Leslie Bldg., Lyndhurst, New Jersey

Over 275 Factory-Trained Engineers At Your Service—Nationwide!

For more facts circle 582 on Reply Card

Borrow these trained eyes to check your roof completely...

YOUNG ROOFING CO., ST. LOUIS, MO.



EXCLUSIVE. NO OBLIGATION—*You get a detailed report like this, covering your roof and all its needs.*

Could you spot ALL the places a roof can fail and cost you thousands of dollars? The approved Johns-Manville Roofing Contractor near you has both the knowledge and experience to locate troubles before they happen . . . and knows what to do about them. He shows you how to budget the whole job to avoid heavy expense.

With a J-M Roof Survey—available to you without obligation—you get a report on present defects. More important, it points out future trouble spots too. And it recommends clearly and concisely what to do and what the cost will be—using quality Johns-Manville Roofing Products and the services of your J-M Contractor.

Borrow his trained eyes today. He's listed in the Yellow Pages of your phone book under "Roofers." Or write Johns-Manville, Box 158, Dept. PE-5, 22 East 40th Street, New York 16, N. Y. In Canada, address Port Credit, Ontario.

JOHNS-MANVILLE

J-M 7★ 7-STAR VALUE PRODUCTS

For more facts circle 587 on Reply Card

REWOUND MOTORS, INSULATED WITH SUPER COILIFE, ARE NO LONGER ORDINARY MOTORS

Exclusive epoxy encapsulation adds extra endurance, extra performance, extra life

These extra measures of rewind value—provided by Westinghouse Super COILIFE*—have been conclusively proved. For example, a Westinghouse motor stator, encapsulated with Super Coilife, spent 99 days at the bottom of Great Salt Lake. More than a quarter of this "water" is salt. This same stator was towed underwater by riverboat 1500 miles from Vicksburg to Pittsburgh. Neither of these strenuous trials-by-water had any detrimental effect on Super Coilife.

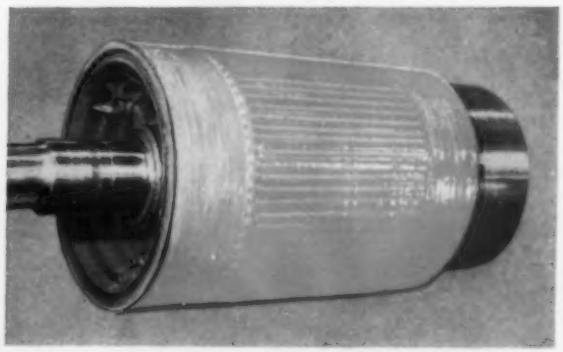
The extraordinary low viscosity of Super Coilife permeates slots and interstices, thoroughly protecting windings inside and out. The specialized application process also provides exactly the right "thin-wall" thickness for each type and class of winding for maximum heat dissipation. Moisture, acids, alkalis, oils and dirt are kept completely and permanently out with this solventless epoxy encapsulation.

Super Coilife has already proved itself in thousands of applications throughout industry such as paper, steel and food processing plants where high humidity is a factor; chemical, petroleum and coke processing plants with critical acid and alkali conditions; mining operations where abrasive matter is a problem; and utilities where fly ash is prevalent.

Super Coilife is an exclusive process of Westinghouse repair plants and can be applied to random wound stators, rotors and armatures. Call your Westinghouse representative for your next rewind job. He will explain the values of Super Coilife and the many other services provided by our repair plants. Write for booklet B-7622, Westinghouse Electric Corporation, P. O. Box 868, Pittsburgh 30, Pennsylvania. J-95213

*Trade-Mark

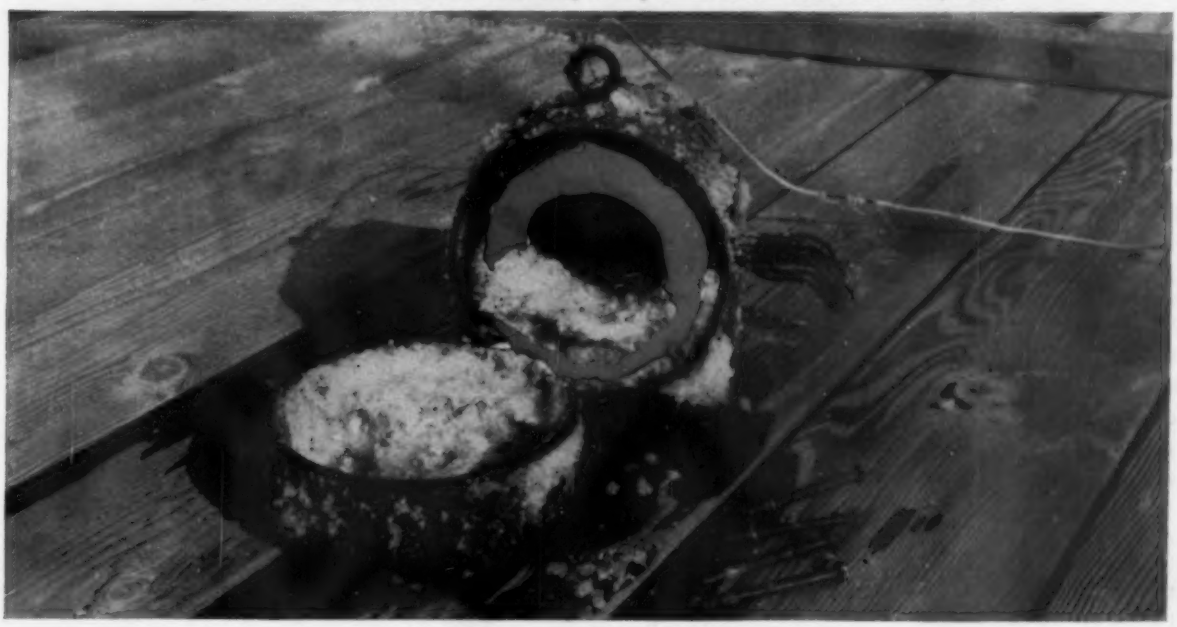
The epoxy encapsulation of this rewound d-c armature offers effective and permanent protection to the windings. Exclusive polyester glass banding is part of the armature rewinding process by Westinghouse.



YOU CAN BE SURE... IF IT'S Westinghouse

WATCH "WESTINGHOUSE LUCILLE BALL-DESI ARNAZ SHOWS" CBS TV ALTERNATE FRIDAYS

Super Coilife insulation was not affected by 99-day immersion in Great Salt Lake, Utah.



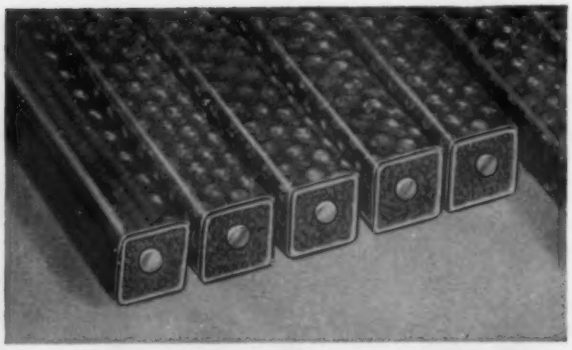
For more facts circle 583 on Reply Card

Exide-Ironclad for highest battery

Now your electric industrial trucks can do even more work for you than they ever did—and at a lower cost per hour. Because this new Exide-Ironclad Model TGS Battery packs still more power into the same space and gives you even lower power cost per ampere-hour. *Exide brings you this power increase while maintaining the same unmatched battery life potential.*

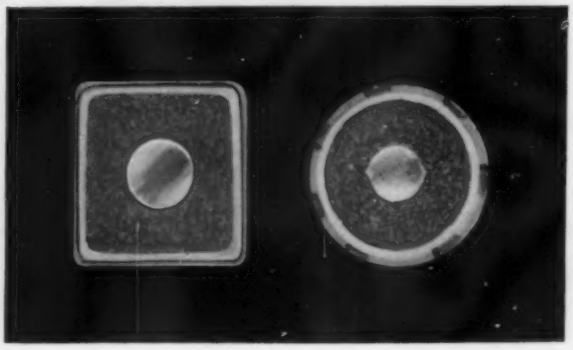
Here's the secret

You are looking at the newest, most advanced development in battery design yet: the square tube positive plate. The square tubes hold more usable active material than was ever before possible. That means longer sustained power for all day running. They add 33% to the plate's surface area for higher current capacity under sudden heavy loads.



Exide introduced the tubular positive plate battery 50 years ago. For long life and economy, it has never been equaled. Constant laboratory research has yielded numerous improvements over the years. Hence Exide-Ironclad Batteries have led the way in power, battery life and economy. And now here is the square tube positive plate.

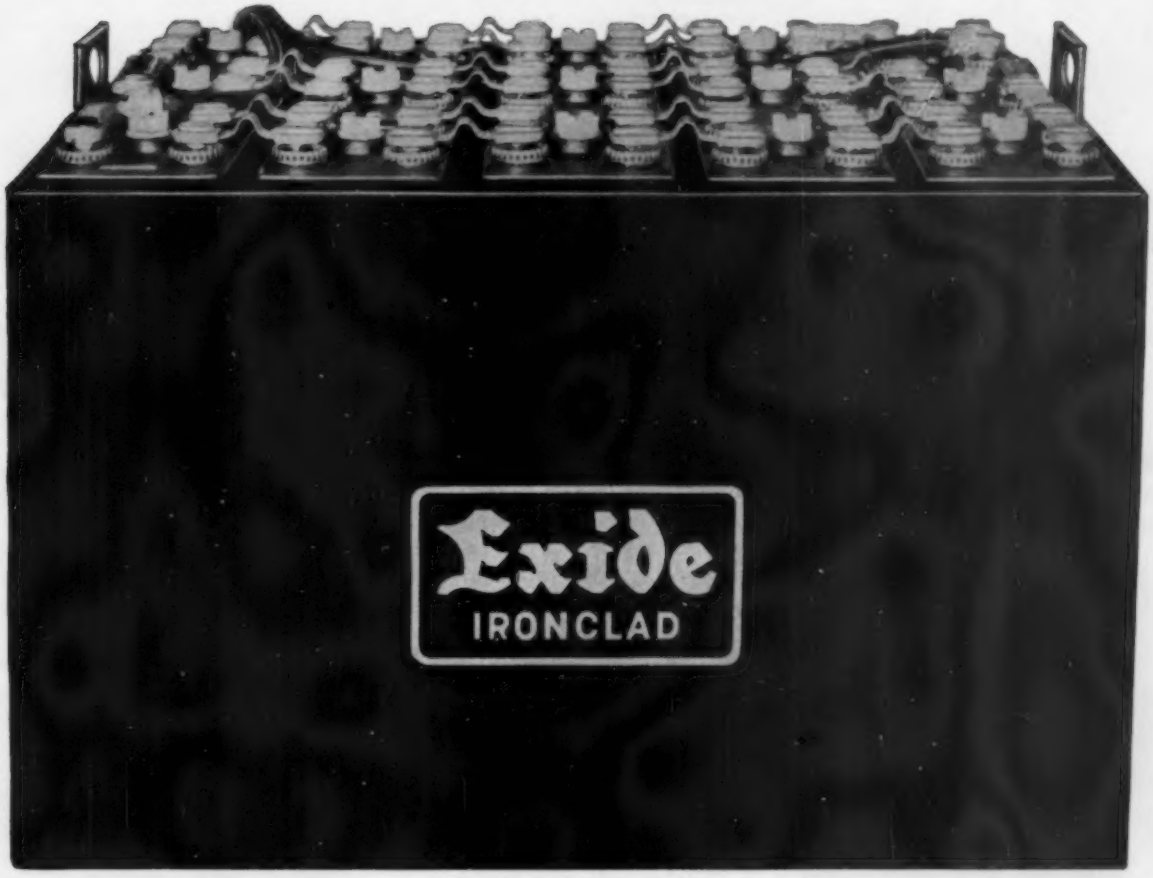
See how much more active material the square tube holds. These cross-section views compare the new square tube with the former round tube. Look at the extra active material. And look at the larger perimeter that means extra surface area on the plate. This is the reason the new Exide-Ironclad Battery packs more power with no increase in space, and why it gives you so much power per dollar of cost.



power boosted 11% economy yet

800 AMP-HR

Exactly the same outside dimensions as the former 720 amp-hr battery. This is possible because the capacity per positive plate has been increased from 72 to 80 amp-hr. Other new 22⅝-in.-high Exide-Ironclad Batteries available in capacities from 400 to 1280 amp-hr. Write for detailed bulletin. Exide Industrial Division, The Electric Storage Battery Company, Philadelphia 20, Pa.



Exide® THE ELECTRIC STORAGE BATTERY COMPANY

For more facts circle 584 on Reply Card

MODERN MAINTENANCE

IS PROFITABLE MAINTENANCE

R. L. Kirkpatrick, *Manager, Maintenance Sales*, Westinghouse Electric Corporation

Can You Afford to Do Your Own Electrical Repair Work?

There is a trend for industry to do less and less of its own repair work on production equipment and devote more time to preventive maintenance. There appears to be two major reasons behind this trend: (1) the ever-increasing demand for greater operating reliability of all production equipment, and (2) the high cost of operating in-plant repair facilities.

Maintenance Managers are primarily concerned with increasing the operating reliability of all production equipment to cut down time. The high costs of down time are well known . . . ranging from five dollars to more than one thousand dollars a minute. Maximum reliability can be built into repaired equipment. Modern repair plants are specialists in this field. These plants have the very latest facilities and factory-trained repair technicians. They are thoroughly equipped to handle repairs on all sizes of electrical equipment. Each job is carefully engineered to solve the exact problem that caused the original failure . . . whether electrical, mechanical, or both. Most of these plants guarantee their work. On rewound motors, for example, they provide a one-year guarantee . . . the same as on a new motor. As a matter of fact, when these modern repair plants return your electrical equipment it is often better than when new. They employ the latest

Westinghouse maintenance service

Motor life more than doubled

A pump motor exposed to considerable acid and moisture in a pulp and paper mill had previously required rewinding on an average of three times per year. Westinghouse maintenance service was called on to solve this motor problem. Super COILIFE* epoxy encapsulation was provided as insulation. After nine months, motor is still operating satisfactorily. The same company has since sent two additional motors for rewinding and processing with Super Coilife. *Trade-Mark

Voltage leakage test of large d-c motor in processing plant—one of many tests in the Westinghouse contract plan augmenting the company's preventive maintenance program.

Westinghouse maintenance proves fast, dependable

A 2850-hp induction motor on a river dredge, operating continuously at high overload, recently required fast and highly capable maintenance. The call came to the Westinghouse engineer at 1 A.M. The motor had lost three coils. Despite dense fog, regional cold and confusing levee roads (according to the report), the coils were removed and the motor was back in service the same morning. Arrangements were made to order mechanical parts and Thermalastic®-insulated coils for a complete overhaul, performed by Westinghouse at a later date. The motor now is better than when the customer originally purchased it in 1926.

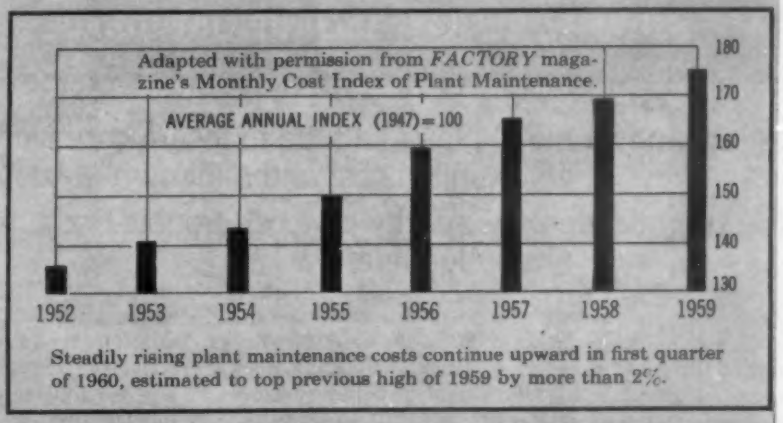
Costly down time eliminated with scheduled inspection

"In-service" failures of large motors operating processing equipment of a large Midwestern company were a serious production problem to Maintenance Management. Westinghouse recommended an annual inspection and testing program to prevent such breakdowns. Field Service Engineers have conducted thorough

developments in materials and techniques. Up-to-the-minute instruments are used to thoroughly test all repaired equipment before it is returned to you. In short, a modern repair plant does everything possible to build maximum operating reliability into your production equipment.

The expert services of a modern repair plant are also available around-the-clock, seven days a week. These specialists are ready to provide service in your plant as well as in their own on a planned or emergency basis. You pay for these services only when you use them. There are no continuing overhead costs to worry about.

This brings us to the second reason for this trend . . . the high cost of operating in-plant repair facilities. In any production process there are bound to be peaks and valleys in the amount of repair work required. This results in disjointed working schedules and expensive overtime. Overhead costs go on regardless of the amount of work being done. There is seldom an even flow of repair work, so that it is virtually impossible to staff the repair shop to meet the varying requirements and emergencies. In addition, major capital expenditures are periodically necessary to keep up to date with testing and repair equipment, materials and the latest techniques.



Steadily rising plant maintenance costs continue upward in first quarter of 1960, estimated to top previous high of 1959 by more than 2%.

By having outside experts handle your repair work you can cut repair costs, improve performance reliability, extend the life of equipment, have more square feet for your own production needs and more people available for production and preventive maintenance work.

Can you afford to do your own electrical repair work?

assures production reliability

mechanical and electrical tests of the machines over the past five years during the annual vacation shutdown periods. Each year they have made recommendations to the company as to the necessary maintenance work to be performed. The contract has completely eliminated large motor down time.

Super Coilife epoxy encapsulation protects the windings of this 10-hp motor from severe acid and moisture conditions which previously caused repeated failure.

In addition to a basic repair service, Westinghouse offers you a score of extra benefits. The repaired equipment will often be better than when new, because Westinghouse actually rebuilds equipment, investigates every opportunity to use up-to-the-minute developments such as exclusive Westinghouse insulations... Thermalastic, Super Coilife, Bondite. At the same time your equipment is being repaired, it can be uprated mechanically and electrically . . . with features of the most recent equipment on the market. Other Westinghouse pluses include complete electrical and mechanical testing equipment, trained specialists for every phase of the job, inventive engineering—difficult to match anywhere.

Westinghouse is providing a comprehensive maintenance and repair service for thousands of plants today and for all types and classes of a broad range of electrical and steam equipment. We invite you to visit any of the 42 Westinghouse modern repair plants. Your Westinghouse representative will be glad to make arrangements for your visit. Take that opportunity to discuss the ways in which Westinghouse can help you prepare a modern maintenance program that will save you money . . . no matter what your in-plant costs are today!

J-95214

YOU CAN BE SURE...IF IT'S

Westinghouse

WATCH "WESTINGHOUSE LUCILLE BALL DESI ARNAZ SHOWS"
CBS TV ALTERNATE FRIDAYS

For more facts circle 585 on Reply Card

See why ALCOA ALUMINUM makes a good design habit

Requirement: metal pipe and tube to insure corrosion-free fluid handling at low initial cost and minimum upkeep

Key to good design: specify low-cost, trouble-free tubular products of Alcoa Aluminum

The overpowering volume of pipe and tubing needed in the process industries makes it one of the biggest single material investments in most plants. Historically, the repair, maintenance and replacement of piping systems has been too, one of the biggest causes of an alarming increase in maintenance costs. Both factors make vital a clear understanding of the rather remarkable advantages of aluminum pipe and tube.

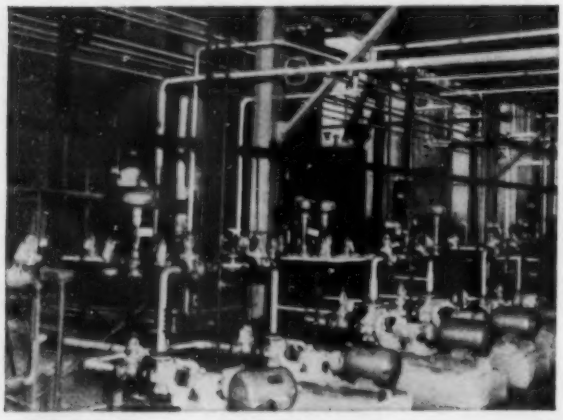
First of all, from a cost standpoint, aluminum is very frequently the lowest cost material suitable for a wide variety of applications in moving fluids through a plant. Consider, for example, the fact that the initial cost of aluminum may often average as much as 50 per cent less than that of admiralty for identical applications. Even greater savings apply when other metals such as stainless or mild steel are compared with aluminum.

Beyond these initial cost savings, aluminum provides significant maintenance benefits. For instance, no other commonly used metal offers aluminum's great resistance to corrosion. And the corrosion resistance for specific alloys exposed to particular environments can be determined from a substantial body of factual service data accumulated by ALCOA over the past 40-odd years.

It is hardly surprising that aluminum, in a variety of tubular forms, is gaining the confidence of more and more designers and builders in the process industries . . . as suggested by the aluminum applications described on these pages. ALCOA's engineers are anxious and willing to share their factual knowledge of aluminum which inspires this confidence. They are doing so through a series of engineering conferences being held this year in major cities around the country. Your local ALCOA sales office will be happy to furnish details.

You may also wish to avail yourself of the body of ALCOA literature which describes in technical detail the known performance characteristics of aluminum in a variety of process industries applications. Simply fill in and mail the coupon opposite.

World wide sales through ALCOA INTERNATIONAL, INC., 230 Park Avenue, New York 17, N.Y.

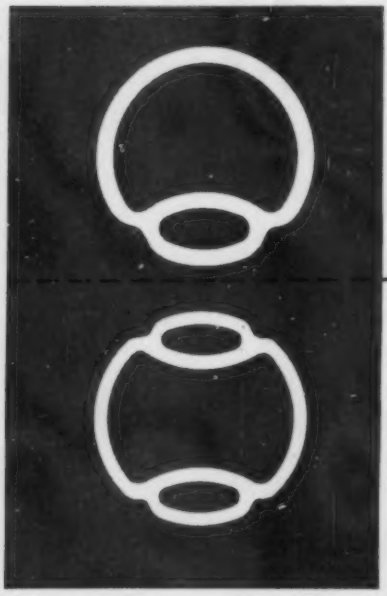


Process piping of Alcoa Aluminum is shown here in a system designed to handle liquid sugar. The natural corrosion resistance of aluminum prevents contamination of the syrup, insures long service life and prevents excessive maintenance. Its scavenging action reduces undesired heavy metal contamination, thereby improving the end product. And aluminum's low friction factor permits fast flow without excessive pumping costs.

This aluminum pipeline is shown being welded and laid in Lake Maracaibo, Venezuela. Aluminum—without special coatings—has proved highly suitable for this operation because it resists so well the corrosive attack of the brackish waters in the lake. Since no coating is required, the low initial cost of the aluminum has proved a significant benefit. The light weight of the aluminum pipe speeded laying operations, and it has no vulnerable coating which would require babying the pipe.

Alcoa Aluminum jacketing keeps the thermal insulation on these large diameter steam lines fully effective. The light, bright aluminum jacketing shields over 5½ miles of piping and insulation from rain, snow, dirt and ice while providing effective protection against a highly corrosive industrial-marine atmosphere.

New UNISTRENGTH pipe by Alcoa now makes it possible to design low-cost welded aluminum lines with uniform bending, bursting and tensile strength throughout their length. The secret is a reduction in wall thickness everywhere but at the ends where it is needed to overcome the local reduction in strength caused by the heat of welding. The result is aluminum piping which weighs up to 40% less but provides equivalent design strength.

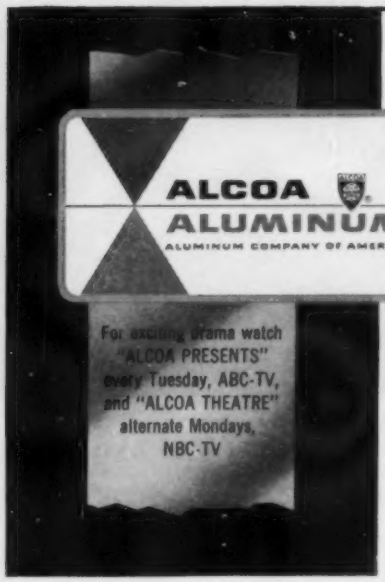


Alcoa UNITRACE is the light, strong, corrosion resistant pipe which provides steam and product passages in a single extruded unit. It has proved an excellent way to cut cost and improve the efficiency of steam traced lines—by eliminating costly external steam jackets or inefficient tracer tubes. Now a new product,

Alcoa DUOTRACE makes possible the same important benefits in steam traced systems where recirculation is desirable. As shown, DUOTRACE provides two trace passages plus the product passage in one extruded unit. Flange and Trace Cap fittings compatible with conventional piping are available for both UNITRACE and DUOTRACE.

Design Note: Consider UNITRACE and DUOTRACE as low-cost successors to both heat exchangers and preheaters.

Alcoa Aluminum heat exchanger tubing is frequently the lowest cost material with suitable corrosion resistance for a variety of heat transfer applications. Moreover, aluminum frequently displays significant extra benefits—as in this pair of aluminum oil-to-oil exchanger bundles for preheating vegetable oils. Here, the aluminum alloys have no catalytic effect on the oxidation of the vegetable oil.


ALCOA
ALUMINUM
ALUMINUM COMPANY OF AMERICA
For exciting drama watch "ALCOA PRESENTS" every Tuesday, ABC-TV, and "ALCOA THEATRE" alternate Mondays, NBC-TV

Aluminum Company of America, 867-E Alcoa Building, Pittsburgh 19, Pa.

Please send me the following literature covering Alcoa Aluminum for tubular products and other uses in the process industries:

- ☐ 10197 Aluminum Pipe and Fittings
- ☐ 34-10418 Alcoa Unitrace: Combines Piping and Tracing in One Unit
- ☐ 10270 Alcoa Utilitube
- ☐ 10460 Process Industries Applications of Alcoa Aluminum
- ☐ 20849 Resistance of Aluminum Alloys to Weathering and Resistance of Aluminum Alloys to Chemically Contaminated Atmospheres
- ☐ 20265 Have You Tried Aluminum in Your Refinery?
- ☐ 20437 Aluminum Alloy Heat Exchangers in the Process Industries
- ☐ 20272 Aluminum Alloys for Handling High Purity Water
- ☐ 21090 Resistance of Aluminum Alloys to Fresh Waters
- ☐ 10130 Forming Alcoa Aluminum
- ☐ 19416 Brazing Alcoa Aluminum
- ☐ 10415 Welding Alcoa Aluminum
- ☐ 19051 Alcoa Aluminum Handbook

Name_____

Company_____

Title_____

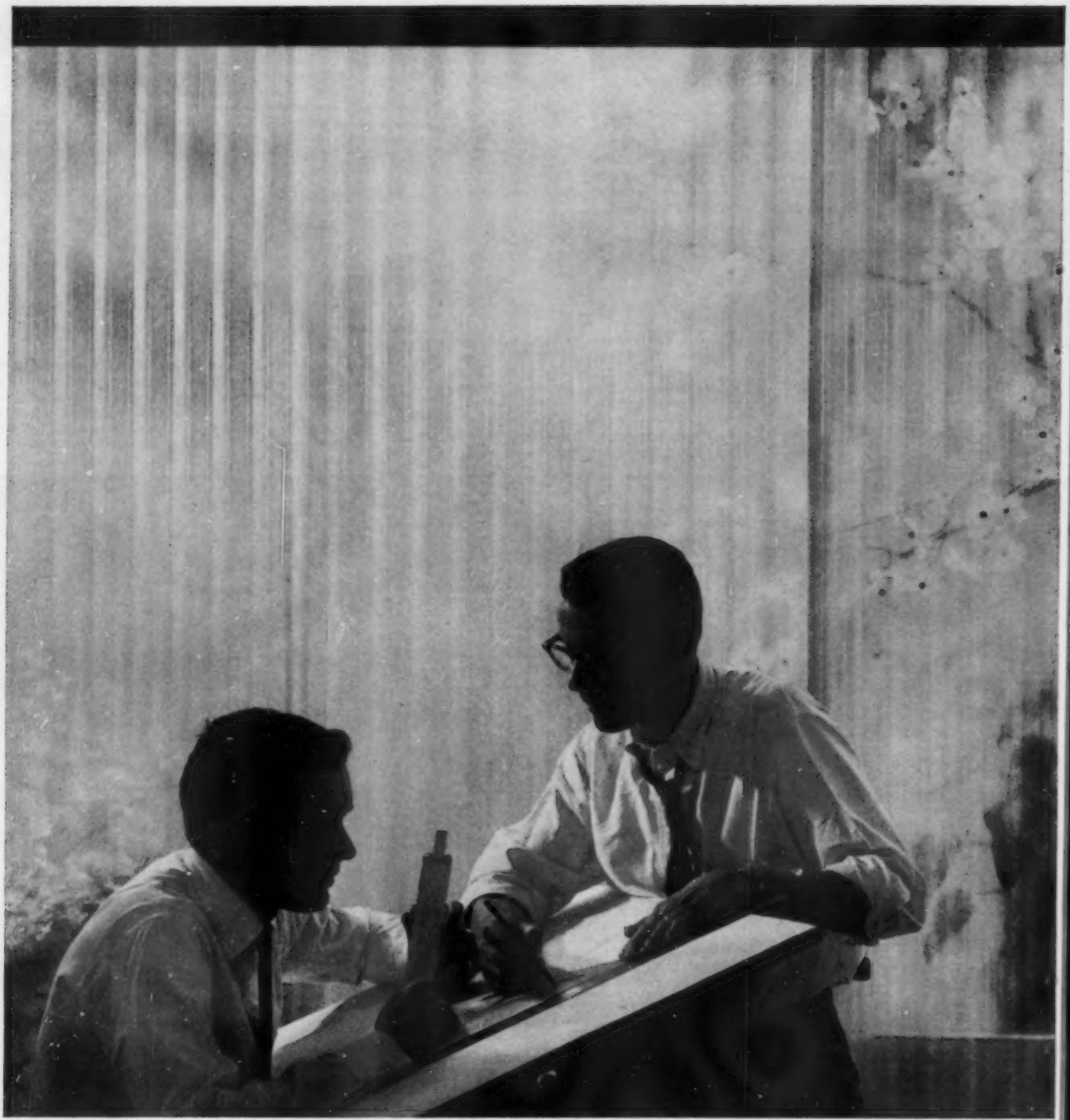
Address_____

City_____

State_____

For more facts circle 586 on Reply Card

Free kilowatts from the sun...with

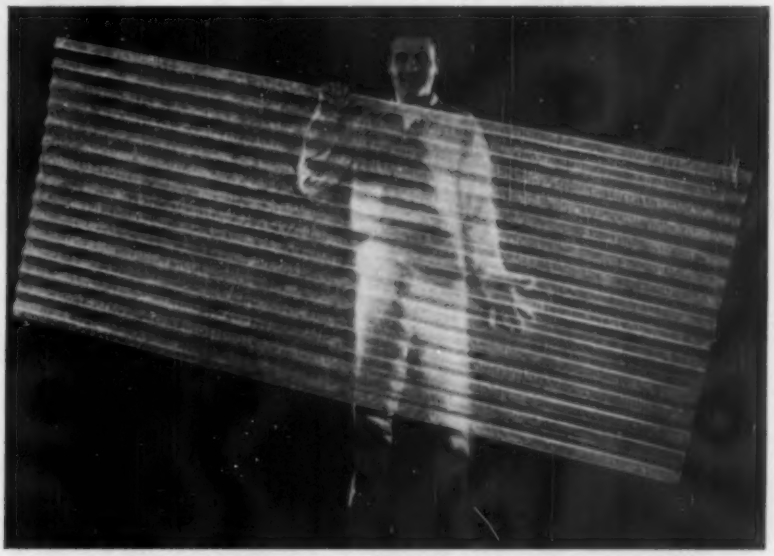


J-M CORRULUX SAVES ON LIGHTING COSTS. Why spend more than you have to for lighting your plant – when you can get plenty of free daylighting with translucent panels of Johns-Manville Corrulux? Shatter-proof Corrulux panels admit over 80% of the light (depending on color)—provide soft, diffused illumination that eliminates spotlighting and glare.

non-glare Johns-Manville CORRULUX

OOPS! BUT DON'T WORRY! Corrulux panels are immune to damage—accidental or deliberate—because these high-strength panes and sheets are impact-resistant. Corrulux is reinforced with fiber glass for extra strength . . . and protection against vibration. violence and most other in-plant dangers.

EASY TO WORK. Corrulux cuts with a handsaw, hand power saw, or hacksaw and fastens with the use of standard tools.



EASY TO INSTALL. Corrulux is light in weight, goes up quickly. It comes in large, easy-to-handle panels. No special framing needed. No installation tricks to learn. Ideal for new construction or remodelling. Comes in standard pane sizes and flat panels for reglazing, too.

WHERE TO GET CORRULUX. For full details, look in the Yellow Pages under *Plastics*, or write Johns-Manville, Box 158, Dept. PE 560, New York 16. In Canada, Plastics and Allied Building Materials, Ltd., Dundas, Ontario.

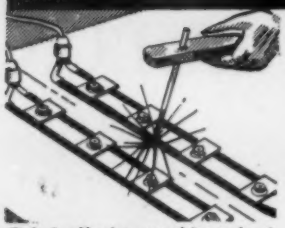
JOHNS-MANVILLE

CORRULUX is a registered trademark of the Johns-Manville Corporation

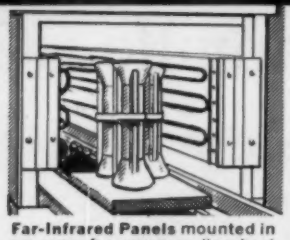
JOHNS-MANVILLE JM PRODUCTS

For more facts circle 588 on Reply Card

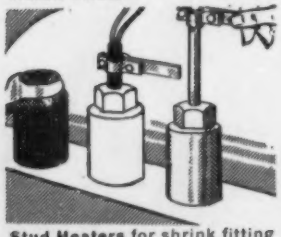
Call your CHROMALOX Man for heating answers



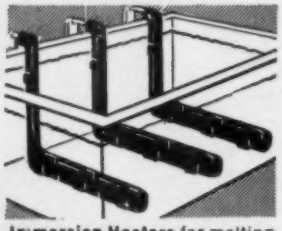
Tubular Heaters used to preheat welding plate to provide more ductile welds.



Far-Infrared Panels mounted in an oven for conveyor line heat treatment of metal parts.

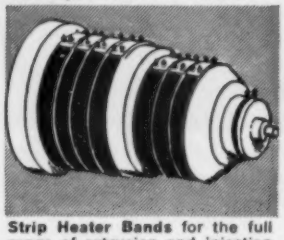


Stud Heaters for shrink fitting large studs and bolts requiring a high degree of tightness.



Immersion Heaters for melting metals such as lead, solder, tin, stereotype metal and babbitt.

Strip Heaters clamped to hopper are thermostatically controlled to keep clay in storage at 60°F.



Strip Heater Bands for the full range of extrusion and injection molding temperatures.

SOLIDS? Only CHROMALOX heats so many things... so many ways

There's one best way to do any job. And you get the best results only by using that one best method.

Regardless of what your heating problems may be . . . your best chance of finding the best answer is to call your Chromalox Man.

- He represents more than 15,000 different types, sizes and ratings of electric heaters and heating elements . . . the world's largest line.
- He orders from the world's largest stock.
- An he is a heating expert . . . he understands your problem and can help you find the answer.

No matter what your heating problem is . . . solids, liquids or gases . . . call your Chromalox Man for the efficient, electrical answer. Or, check the boxes below, write your name, title, and address at the bottom of this page and mail the coupon to us.

Edwin L. Wiegand Company
7500 Thomas Boulevard, Pittsburgh 8, Pa

- ☐ Send me Catalog 60 (General Industrial heating applications).
- ☐ Send me specific information on the heating problems I have outlined on the sheet attached.
- ☐ Have a Chromalox Representative contact me.
- ☐ Do not have a Chromalox Representative contact me.

For more facts circle 589 on Reply Card

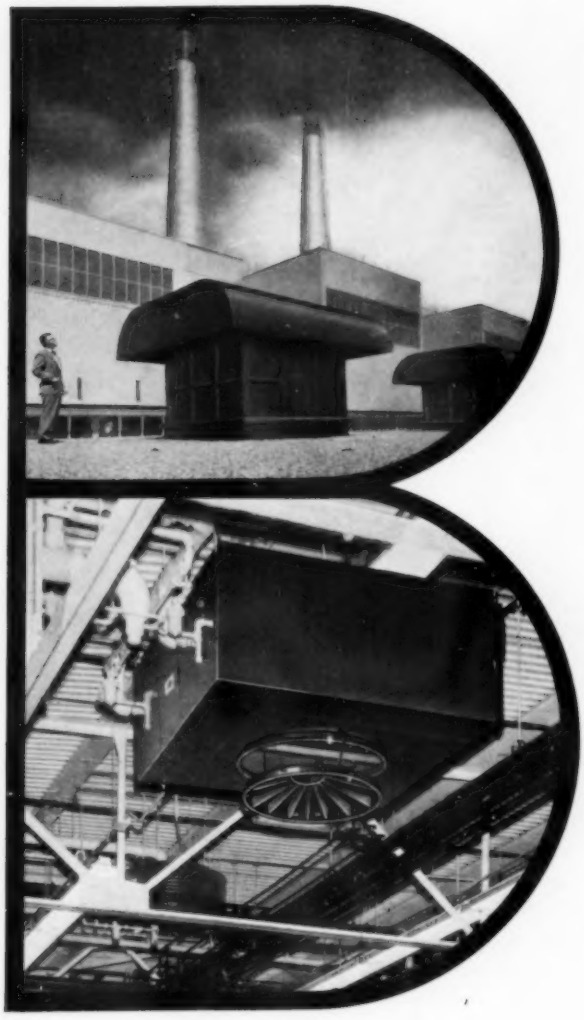
Sales-Engineering Representatives

ALBANY, N.Y. Hobart 3-0626
ATLANTA, GA. Trinity 5-7244
BALA-CYNWYD, PA. Mohawk 4-6113 Greenwood 3-4477
BALTIMORE, MD. Hopkins 7-3280
BLOOMFIELD, N.J. Edison 8-6900 New York: Worth 4-2990
BOSTON, MASS. Liberty 2-1941
BUFFALO, N.Y. Summer 4000
CHARLOTTE, N.C. Edison 4-4244 Franklin 5-1044
CHATTANOOGA, TENN. Amherst 5-3862
CHICAGO, ILL. Harrison 7-5464
CINCINNATI, OHIO Trinity 1-0605
CLEARWATER, FLA. Phone 3-7706
CLEVELAND, OHIO Prospect 1-7112
COLUMBUS, OHIO Amherst 7-8260
DALLAS, TEX. Riverside 8-9004
DAVENPORT, IOWA Phone: 6-5233
DENVER, COLO. Glendale 5-3651 Genesee 3-0821
DES MOINES, IOWA Cherry 3-1203
DETROIT, MICH. University 3-9100
HOUSTON, TEX. Capitol 5-0356
INDIANAPOLIS, IND. Melrose 5-5313
KANSAS CITY, MO. Victor 2-3306
LOS ANGELES, CAL. Richmond 7-5191
MIDDLETOWN, CONN. Diamond 6-9606
MILWAUKEE, WIS. Broadway 1-3021
MINNEAPOLIS, MINN. Federal 6-6631
NASHVILLE, TENN. Cypress 2-7016
NEW YORK CITY, N.Y. (See Bloomfield, N.J.)
OMAHA, NEB. Atlantic 7600
PHILADELPHIA, PA. (See Bala-Cynwyd, Pa.)
PITTSBURGH, PA. Emerson 1-2900
PORTLAND, ORE. Capitol 3-4197
RICHMOND, VA. Atlantic 8-8758
ROCHESTER, N.Y. Hamilton 6-2070
ST. LOUIS, MO. Chestnut 1-2433
SAN FRANCISCO, CALIF. Underhill 1-3527
SEATTLE, WASH. Main 4-7297
SYRACUSE, N.Y. Granite 4-3933
WICHITA, KAN. Amherst 2-5647

CHROMALOX ELECTRIC HEAT

BUFFALO PACKAGE UNITS

VENTILATE LARGE AREAS AT LOW COST



1 **EXHAUSTING THRU THE ROOF**—the best way to remove fumes, dust, vapors and stale air from large working areas where ducts are not feasible. Buffalo Power Roof Ventilators like this Style "H" Sky-Vent are easily-installed, weatherproof "packages" that do the job to perfection. Just mount in roof opening over areas to be ventilated — your own maintenance staff can do it! Gain further savings thru Buffalo efficiency and freedom from troubles. 12″ to 120″ wheel sizes (1000 to 250,000 cfm) for any ventilation job you may have. Write for Bulletin FM-2345 for all details.

2 **REPLACING EXHAUSTED AIR WITH FRESH, CLEAN AIR.** Buffalo Makeup Air Units like this ceiling installation draw in fresh outside air, heat it, filter it and distribute it properly — replacing air and heat removed by exhaust systems or forced draft fans. Buffalo builds a complete line of Makeup Air Units, including Heating and Ventilating Units and "PC" Cabinets for simplified installation thru roofs or outside walls. Capacities and designs to suit your needs, quality construction to give you trouble-free satisfaction at lowest operating costs.

Buffalo makes Fans and Central System Air Conditioning Units to match the many variations in ventilating requirements from plant to plant. For suggestions on your specific problem, consult your nearby Buffalo representative.

BUFFALO FORGE COMPANY

Buffalo, New York

Buffalo Pumps Division • Buffalo, N. Y.

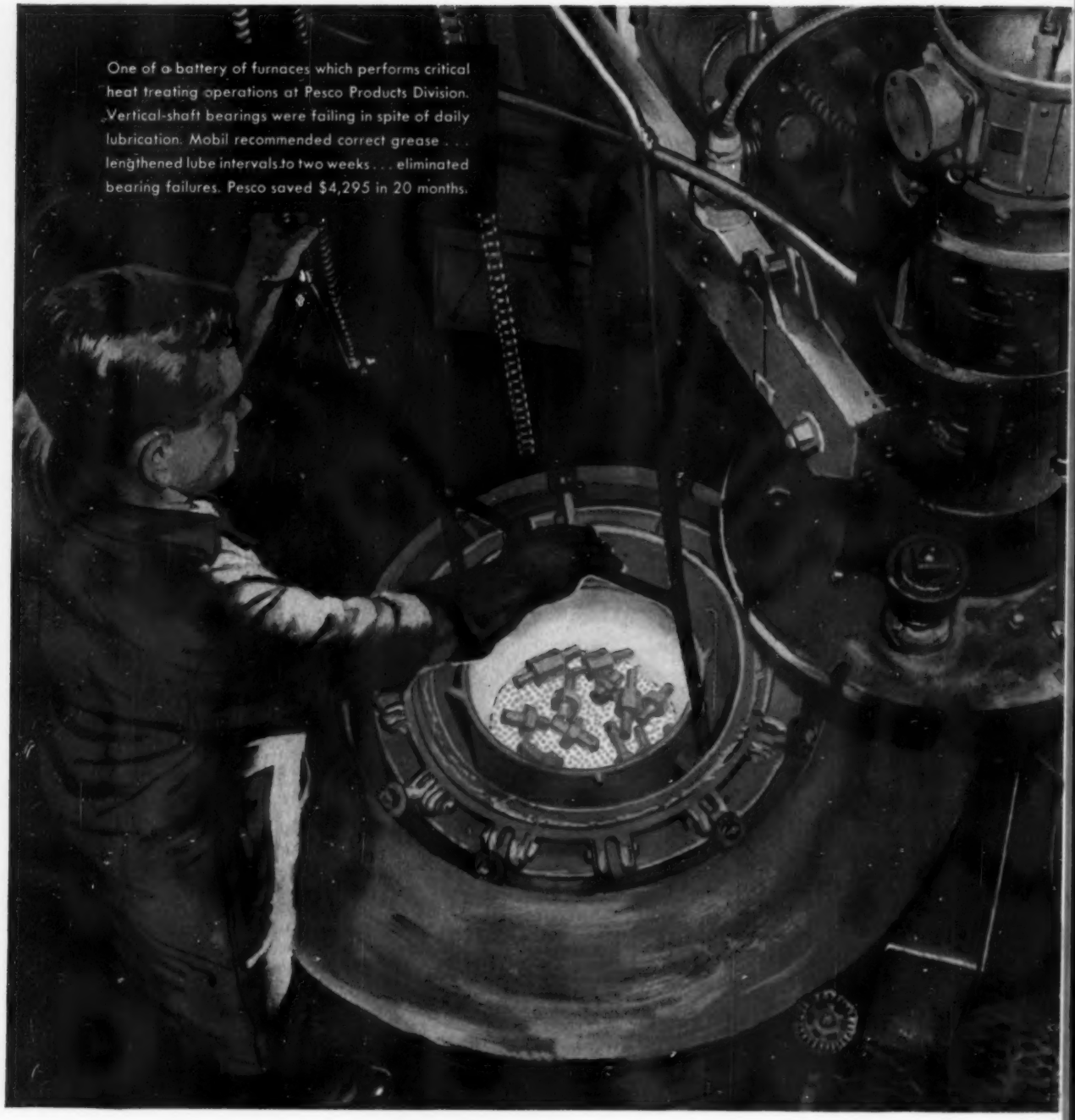
Canadian Blower & Forge Co., Ltd., Kitchener, Ont.

"Buffalo"

VENTILATING • AIR CLEANING • AIR TEMPERING • INDUCED DRAFT • EXHAUSTING • FORCED DRAFT • COOLING • HEATING • PRESSURE BLOWING

For more facts circle 590 on Reply Card

Pesco shows $11,735 saving


One of a battery of furnaces which performs critical heat treating operations at Pesco Products Division. Vertical-shaft bearings were failing in spite of daily lubrication. Mobil recommended correct grease . . . lengthened lube intervals to two weeks . . . eliminated bearing failures. Pesco saved $4,295 in 20 months.

Mobil Correct

with Mobil Program

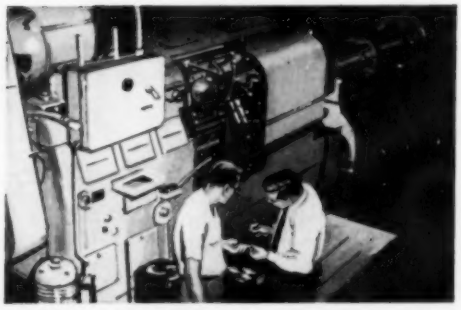
At Borg-Warner Corporation's Pesco Products Division, Mobil helps cut maintenance costs, increase production

Pesco Products ranks with the nation's foremost suppliers of components and systems for aircraft and space-vehicles . . . must maintain exacting product reliability and rigid schedules. To help meet these critical requirements, Pesco turned to a Mobil Program of Correct Lubrication.

Mobil engineers began a program of analysis and study of Pesco maintenance and lubrication procedures in cooperation with Pesco personnel. The improved methods, schedules, and recommendations that resulted brought Pesco maintenance to a new standard of efficiency and economy. Special areas of assistance by Mobil included instruction of maintenance crews, lubrication charts and recommendations, and problem-solving in high-cost areas. In 20 months, the Mobil Program saved Pesco $11,735.

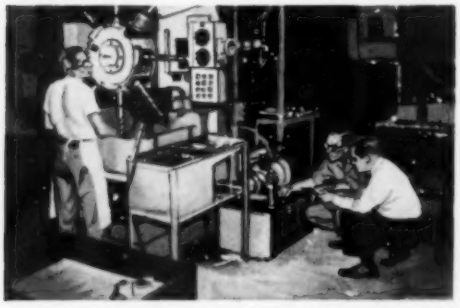
To find out how a Mobil Program may benefit *your* plant, write for an informative brochure. Or call your local Mobil representative.

MOBIL OIL COMPANY
150 East 42nd Street, New York 17, N. Y.



1. Sticking clutch plates on automatic screw machines posed costly maintenance problem for Pesco. Mobil traced the trouble to the oil used for machine lubrication . . . supplied a dual purpose fluid that eliminated the clutch problem, prevented loss of the cutting oil effectiveness as well . . . saved $3,528 in 20 months.

2. In Pesco's chucking department, lathes would not hold tolerance during the warmup because of oil characteristics. Mobil product eliminated the problem . . . saved Pesco $1,072 in lost production time. And on automatic chuckers, a Mobil hydraulic oil ended recurrent pressure losses . . . saved $1,960 in maintenance costs in 20 months.

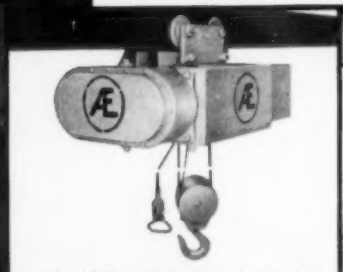


3. On Pesco's hydraulic machinery, oil deterioration led to sticky valves, erratic operation, machine tool shutdowns. Mobil trained plant personnel in preventive maintenance procedures, recommended proper fluids . . . cut hydraulic maintenance by 40%.

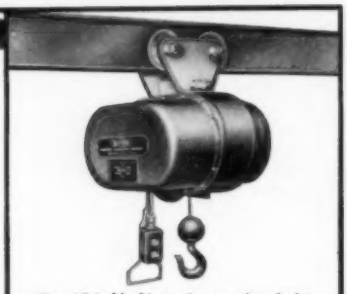
4. Mobil studied Pesco's oil usage patterns . . . recommended bulk storage for certain petroleum products. Bulk delivery differential and reduced handling costs totaled $880 for Pesco Products Division in the first year alone.

Lubrication

Meet the "heavy" of all standard heavy duty hoists... priced right... immediate delivery!



The AE Class BB-3, 3-ton standard heavy duty hoist with plain trolley



The AE L-¼, ¼-ton heavy duty hoist.

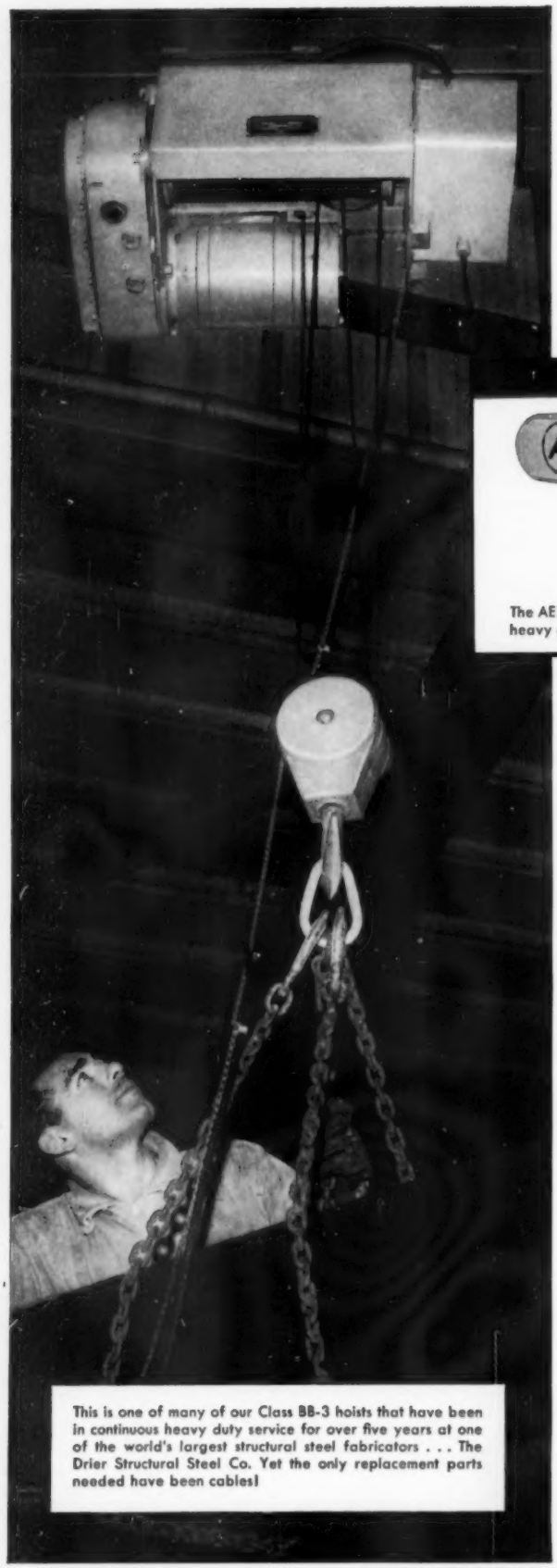
When other heavy duty hoists can't stand the gaff, here's one that will. It's our Class BB-3. Ask any user . . . look at the price, it's low . . . then compare it point by point.

- Welded steel chassis.
- Hardened alloy steel, spur gear drive.
- Double brakes.
- Heavy duty, crane type motor with high starting torque.
- Single-speed, pushbutton control with 120-volt pilot circuit.
- Huskiest, most modern block available.
- Available in all suspensions . . . lug, plain, hand-geared and motor-driven trolleys.

The BB-3 is a standard 3-ton hoist that will stand up on the toughest jobs . . . in the critical spots where production flow must be maintained . . . regardless. It's priced to sell . . . less than many competitive hoists . . . and delivery is immediate from stock!

If you're looking at hoists, don't overlook our L-¼. It is the only truly heavy duty, ¼-ton hoist on the market. Compare its husky 195 lb to the usual 60- to 80-lb hoist, and be convinced! It costs a little more, but it's worth more. It will pay for itself many times over in maintenance savings alone.

For complete information and specifications refer to Sweet's Plant Engineering File 1a/Ae, or write for our new catalog 59.
AMERICAN ENGINEERING COMPANY,
Dept. H-164, Philadelphia 37, Pa.



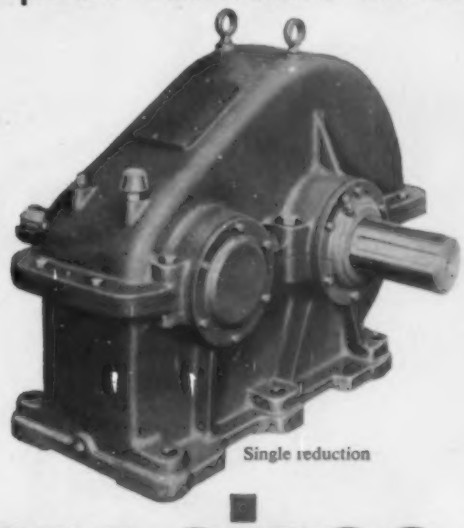
This is one of many of our Class BB-3 hoists that have been in continuous heavy duty service for over five years at one of the world's largest structural steel fabricators . . . The Drier Structural Steel Co. Yet the only replacement parts needed have been cables!

AE AMERICAN ENGINEERING COMPANY
Division of United Industrial Corporation

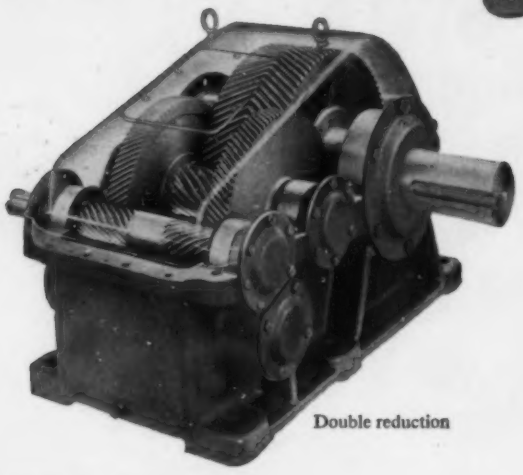
For more facts circle 592 on Reply Card

NOW Link-Belt parallel shaft speed reducers offer

new design



Single reduction



Double reduction

new sizes

new ruggedness

Triple reduction

reduce drive costs by matching drive size to horsepower requirements with 35% more sizes

New design—Herringbone or double helical gears arranged in new "balanced" design permit high horsepower, high ratio reduction in a sturdy, compact housing.

New sizes—Now 18 sizes each of double and triple reduction units; 17 single. Drive selections closely match hp requirements, with a corresponding reduction in drive costs. Available to 2800 hp, ratios to 292:1.

New ruggedness—Rigid, ribbed housing keeps parts accurately and permanently aligned even under grueling operating conditions involving heavy shock loads, and temporary overloads.

For complete information call your nearby Link-Belt district sales office or authorized stock-carrying distributor. Ask for Book 2719.

OUTSTANDING FEATURES

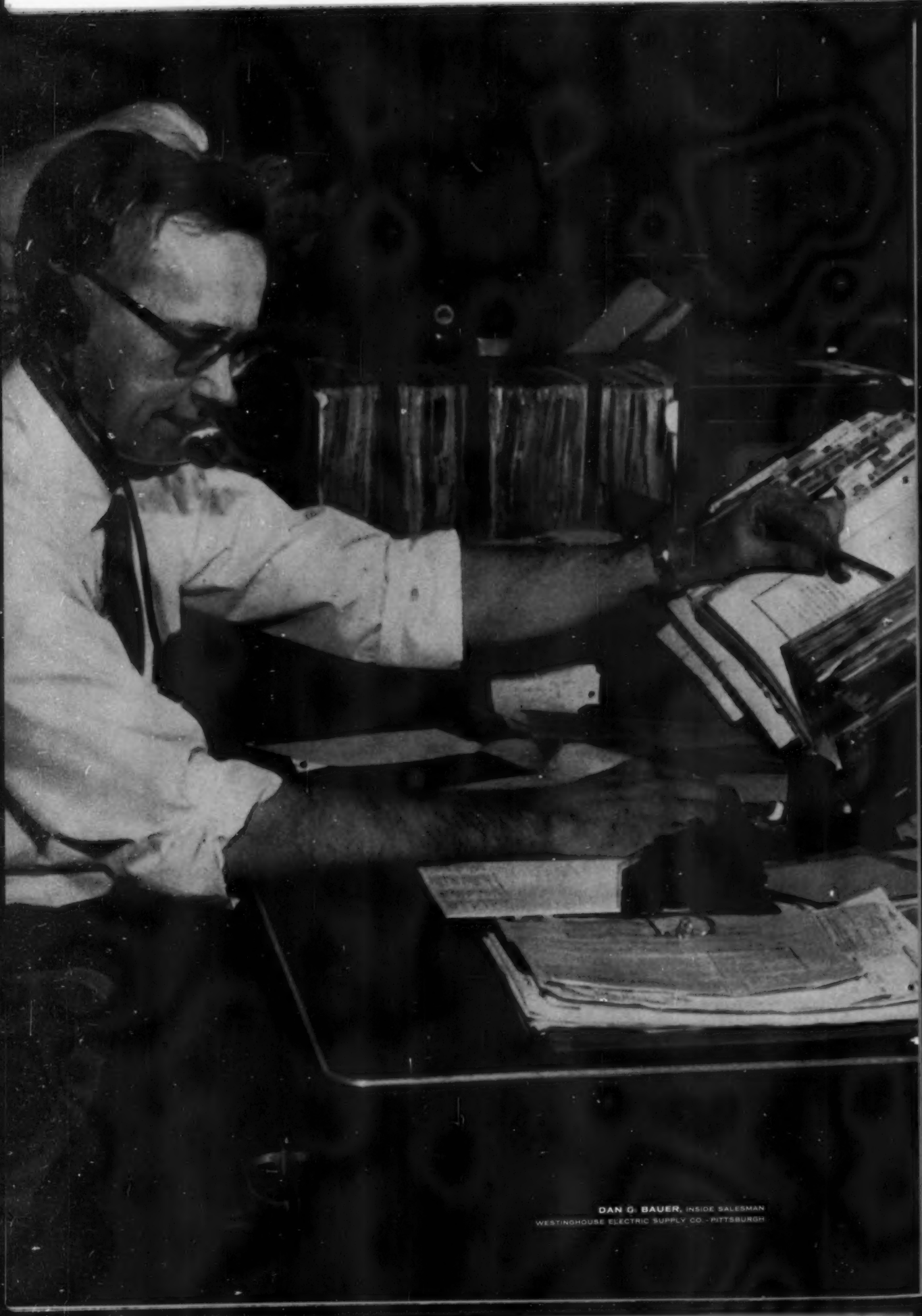
- Grease-lubricated seals.
- Positive splash lubrication supplies ample flow of oil to all moving parts.
- High-capacity spherical roller bearings for maximum loading.
- Gears of hardened, precision alloy steel. Double helical or herringbone design.
- New, built-in backstop.
- Exceptional wearing qualities in accurately machined low-speed shafts of heat-treated carbon steel; intermediate shafts of chrome-molybdenum steel.
- Cast iron housing maintains permanent, accurate alignment of all parts.

LINK-BELT

SPEED REDUCERS

LINK-BELT COMPANY: Executive Offices, Prudential Plaza, Chicago 1. To Serve Industry There Are Link-Belt Plants, Warehouses, District Sales Offices and Stock Carrying Distributors in All Principal Cities. Export Office, New York 7; Australia, Marrickville (Sydney); Brazil, Sao Paulo; Canada, Scarboro (Toronto 13); South Africa, Springs. Representatives Throughout the World. 15.384

For more facts circle 593 on Reply Card



DAN G. BAUER, INSIDE SALESMAN
WESTINGHOUSE ELECTRIC SUPPLY CO. - PITTSBURGH

YOUR WESTINGHOUSE DISTRIBUTOR INSIDE SALESMAN—

ALWAYS AVAILABLE TO SAVE YOU MONEY

You know him well . . . though you may never have *met.*

Every time you call your Westinghouse distributor, you recognize his courteous and friendly voice. Inside Salesman is his title, but that doesn't *begin* to describe the jobs he does for you.

Materials consultant, order writer, expediter, trouble-shooter, hub of communications . . . his main function is *service.*

He'll take your order on the phone. He knows what's in stock . . . offers guidance on your purchases . . . and more than that, he'll make sure you get the order when you need it.

You've probably marveled at his encyclopedic knowledge . . . able to answer any question you may ask from his "six-foot" shelf of catalogs.

Yes, the Inside Salesman is often the most important man in the whole distributor operation. He's the man you can count on when the pressure's on.

He's one more excellent reason it pays *you* to do business with your Westinghouse electrical distribution outlet. Call him next time you need fast delivery of quality electrical products. J-94139

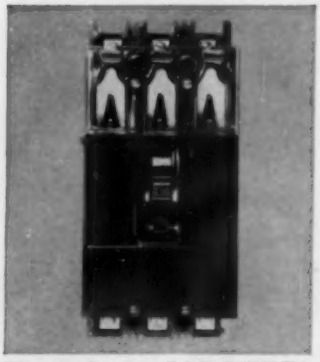
YOU CAN BE SURE...IF IT'S

Westinghouse

WATCH "WESTINGHOUSE LUCILLE BALL-DESI ARNAZ SHOWS" CBS TV ALTERNATE FRIDAYS

Here are some of the many products stocked by your Westinghouse distributor

Westinghouse dry-type transformers are approximately 50% smaller and lighter than other transformers of equivalent ratings, enabling distributors to carry standard stocks — for immediate delivery — for ratings up to 75 kva.



Westinghouse SAF-T-VUE* breakers are unique in their ability to provide safe, sure circuit protection, yet let you see whether contacts are open or closed.

*Trade-Mark

Westinghouse Life-Line® "A" motors. Standard motors in distributor stocks provide a complete line immediately available for many "special" motor requirements.

Watch for the Westinghouse Industrial Apparatus Caravan

For more facts circle 594 on Reply Card

ANNOUNCING A NEW CORPORATE NAME

for The Garlock Packing Company

Garlock Inc. becomes the new name for The Garlock Packing Company, Palmyra, N. Y., to reflect more accurately its broad diversification of products and markets.

Originally established to manufacture mechanical packings, Garlock now produces over 2,000 different styles of packings, gaskets, seals, molded and extruded rubber and plastic products for every major industry.

The new corporate name, Garlock Inc., more closely identifies this 73-year-old company with the growth and development of its product lines. *Today, industry goes to Garlock for such widely diversified products as:*

- Hydraulic-Pneumatic Packings
- Oil and Grease Seals
- Gasketing and Expansion Joints
- Braided Packings
- Molded and Extruded Rubber Parts
- Plastic Stock Shapes and Fabricated Parts
- Mechanical Seals for Rotating Shafts
- Metal Packings
- Leather Packings
- Electronic Components
- Dry Bearing Materials
- Fluorocarbon Tank Linings
- Missile and Rocket Components

To help you in selecting or applying these products, Garlock offers the services of over 126 thoroughly-trained sales engineers, 175 electronic component manufacturers' representatives, 180 authorized bearing distributors and 69 foreign distributors. Conveniently located warehouses and stocking points assure Garlock customers of prompt delivery.

At Garlock Inc., design and development of new or improved products and materials is an ever-present objective. To this end Garlock maintains extensive research and laboratory-test facilities. In addition, Garlock engineers and chemists are always ready to work with you in seeking solutions to tough application problems.

GARLOCK

To find out more about "the new Garlock," call the nearest of our 26 sales offices, or write to Garlock Inc., Palmyra, N. Y. *To assure prompt attention,* please refer to *Garlock Inc.* on all future correspondence and orders.

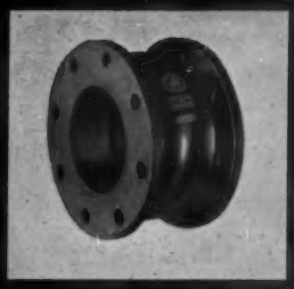
Canadian Div.: Garlock of Canada Ltd.

Order from the Garlock 2,000 . . . two thousand different styles of Packings, Gaskets, Seals, Molded and Extruded Rubber, Plastic Products.

For more facts circle 595 on Reply Card

For more facts circle 594 on Reply Card

Hydraulic-Pneumatic Packings



Expansion Joints

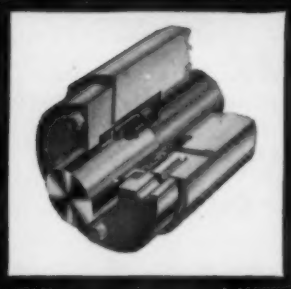
Molded and Extruded Rubber Parts

Plastic Stock Shapes
and Fabricated Parts

Fluorocarbon Tank Linings

Oil and Grease Seals

Braided Packings

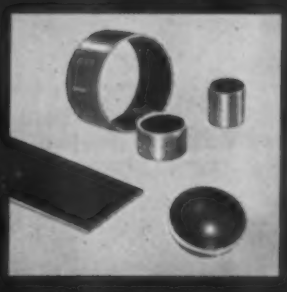


Mechanical Shaft Seals

Metal Packings

Gasketing

Spiral Wound Gaskets



Dry Bearing Material

INC.

Missile and Rocket Components

Leather Packings

Electronic Components

WANT TO SAVE SOME MONEY?

I-T-E URELITE individually enclosed large air circuit breakers. Available up to 600 v a-c, 15-4000 amp continuous, up to 150,000 amp interrupting.

SAVE INSTALLATION EXPENSE

Look at that roomy cable box. I-T-E URELITE® gives plenty of elbow room to the men who install it. Easy to pull and connect even extra-large conductors. You can bring them in from either the top or bottom. This design means fast, easy, low-cost installation.

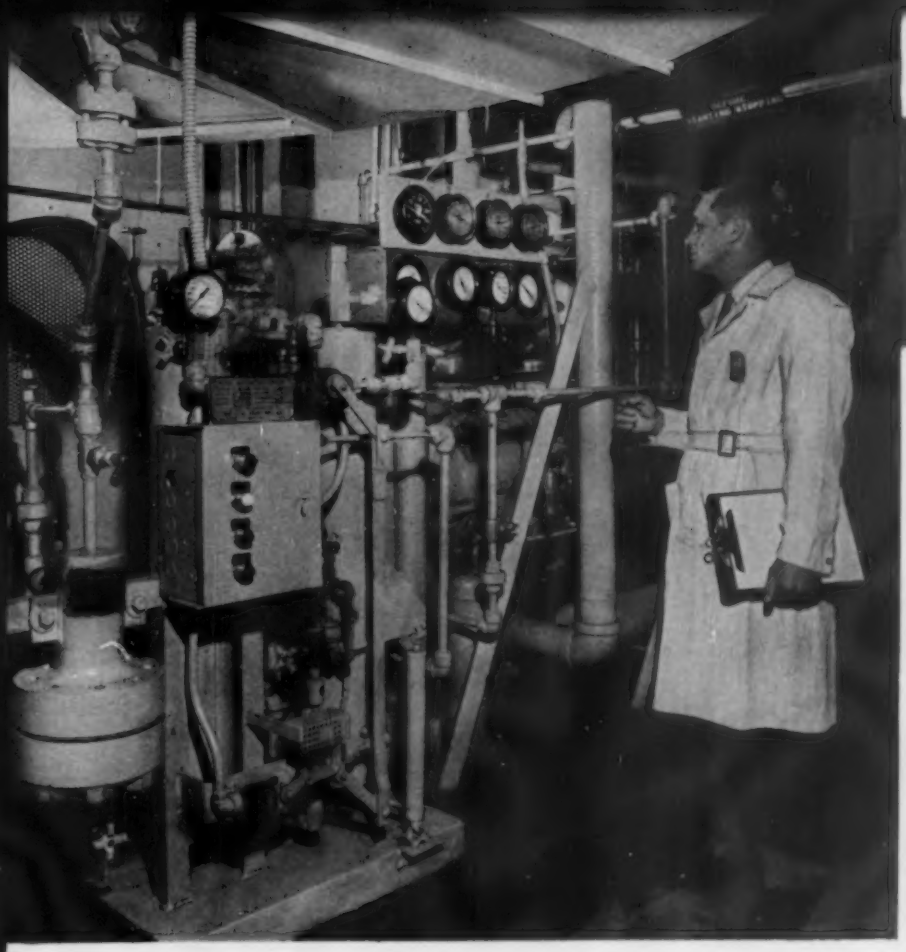
SAVE MONEY WHEN YOUR LOAD GROWS

Want to increase the current rating of your URELITE breaker? Just reset the trip devices. It takes only minutes. Expanded ranges eliminate shutting down the circuit and replacing devices. Calibration is directly in amperes for easy, accurate setting.

Send for new illustrated Bulletin 4261-2b. I-T-E Circuit Breaker Company, Dept. SW., 1900 Hamilton St., Philadelphia 30, Pa.

I-T-E CIRCUIT BREAKER COMPANY

For more facts circle 596 on Reply Card



Right
Four-stage air compressor in operation at Hamilton Standard Division of United Aircraft, Windsor Locks, Connecticut. Fire resistant Celanese Cellulubes materially reduced downtime and maintenance costs.

Below
Mr. Robert Fredrickson, Foreman, checks compressor operation.

Air cost extra thousands...

until Hamilton Standard switched to Cellulubes

At Hamilton Standard, lubrication of a 4200 psi four-stage compressor was a serious problem. Carbon deposits from petroleum lubricants made it necessary to lease a stand-by compressor, and a mechanic was assigned to round-the-clock duty to prevent valve malfunction and spring breakage. Even so, repair bills and maintenance costs ran into large sums of money, and valuable production time was lost. After switching to Cellulube 220, only routine maintenance was required. The formation of petroleum carbon residues ceased, and oil fouling of the compressed air dryer was eliminated. The former constant threat of fire and explosion was also eliminated. Cellulubes made it possible to ship back the stand-by compressor and turn over servicing of the machine to its regular department.

Cellulubes are more than a means of increasing safety. These synthetic lubricants have a cleansing action inside machinery. They give overall wear protection comparable to that of premium petroleum oils. Write for information on how Cellulubes can help you achieve greater efficiency and safety in your plant.

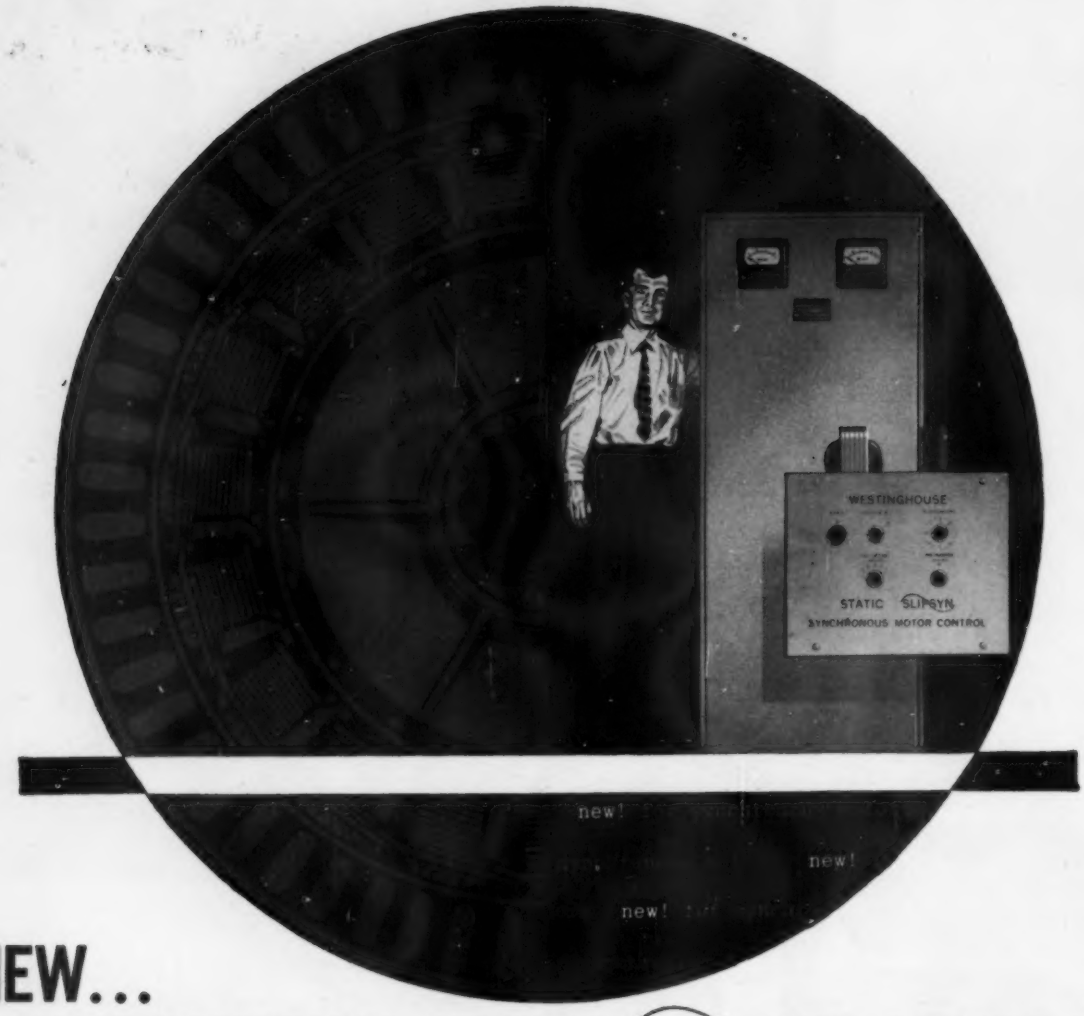
Celanese® Cellulubes®

CELANESE CHEMICAL COMPANY
a Division of Celanese Corporation of America
Dept. 585-E 180 Madison Ave., New York 16, N. Y.

Canadian Affiliate: Canadian Chemical Company Limited, Montreal, Toronto, Vancouver.
Export Sales: Amcel Co., Inc., and Pan Amcel Co., Inc., 180 Madison Ave., New York 16, N. Y.

Celanese CHEMICALS

For more facts circle 597 on Reply Card



NEW... WESTINGHOUSE STATIC SLIPSYN CONTROL

UPS RELIABILITY, VIRTUALLY ELIMINATES MAINTENANCE

STOP PUZZLING over synchronous motor controls ... here's the advanced way to gain top performance. The all-new Westinghouse Static Slipsyn® control pays its own way by chopping motor control maintenance costs, practically eliminating down time and increasing reliability. Check these advantages:

WESTINGHOUSE STATIC SYNCHRONIZING CONTROL has no moving parts. It uses simple, reliable, transistorized networks instead of conventional relays... no contacts, bearings and springs to corrode, wear and fail. Size and weight are greatly reduced—and Static Slipsyn control is immune to contaminated, dusty surroundings.

WESTINGHOUSE STATIC SYNCHRONIZING CONTROL precisely applies motor field excitation at proper speed and pole position up to and including 99% of synchronous speed. Pull-out protection is positive and adjustable to avoid false tripping.

FOR NEW AND OLD INSTALLATIONS. Your Westinghouse salesman will help you apply the completely packaged Static Slipsyn control to synchronous motor installations now being planned. And he can show you how static synchronizing control units can replace the conventional, mechanical relays in your present control enclosures. Either way, Westinghouse Static Slipsyn control saves big money through reduced maintenance, improved reliability, shorter down times.

Contact your local representative or write Westinghouse Electric Corporation, P.O. Box 868, Pittsburgh 30, Pa. J-25001

YOU CAN BE **SURE**...IF IT'S

Westinghouse

WATCH "WESTINGHOUSE LUCILLE BALL-DESI ARNAZ SHOWS" CBS TV ALTERNATE FRIDAYS

For more facts circle 598 on Reply Card

For more facts circle 599 on Reply Card →

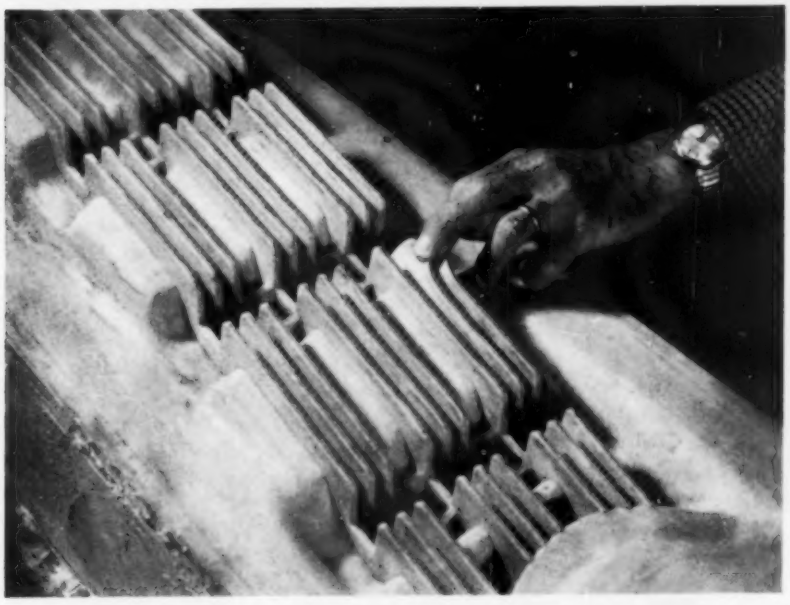
For more facts circle 597 on Reply Card

first in silicones

Dow Corning

SILICONE NEWS

production and maintenance edition • No. 34



"PROLIFIC" MOLD

Here's a five step procedure for making prototype parts that's fast, easy, and assures more perfect finished parts. It features Silastic® RTV, the Dow Corning silicone rubber that vulcanizes at room temperature.

This five step molding cycle, used by Detroit Plaster Cast Foundry, a division of Racine Foundry and Mfg. Co., in making automotive grills, is from positive to negative to positive to negative to final positive. It's the second positive that makes a difference.

First, they make a wooden positive of the grill. Plaster is then poured over this wooden pattern to form a negative mold. Into the plaster is poured Silastic RTV. From this positive another plaster negative is made. Finally, alloys are poured into the plaster mold to form the finished metallic part.

The second positive, the one made with Silastic RTV, is used over and over again — as many as 30 times! It does a much better job of releasing the plaster mold than wood. Another important advantage: Molds made of Silastic RTV make highly accurate reproductions. None of the complex pattern detail is lost.

Molds made from Silastic RTV offer three distinct advantages: 1) reproduction of fine detail; 2) simplicity of use; and 3) natural release of most materials. It will pay you to investigate this easy way of producing faithful reproductions next time you make prototype parts. *No. 747*

Release With Ease

Problems in molding are rarely identical. But there's one answer that's practically universal in the "mold release" problem area. That's a silicone mold lubricant. Here's a good example:

Robinson Industries, Inc., Coleman, Michigan, faced many molding obstacles. Its end product is a sheet-type insulation for refrigerators. In making the insulation, thousands of small, very light polystyrene "berries" are put in the mold and expanded by steam heat. The expanded material is "clingy", making good release difficult. The intricacy of the molds adds to the problem.

Talcum and several other release agents were tried. Under heat of 300 F and 80 psi pressure, followed by alternating water cooling cycles, none of the release agents worked. Then, a coating of Dow Corning 20 Compound was applied. Robinson found that it not only releases easily, but lasts 10 times longer than any other coating used.

Now, Robinson is standardized on silicones. With Dow Corning 20 Compound on the molds, production is up, mold maintenance is virtually eliminated and products exceed quality and appearance requirements. The silicone coating is brushed on only once a day. And one application releases from 50 to 200 parts.

When you're stuck with a mold sticking problem — or better yet, *before* you are — check into Dow Corning Silicones. *No. 748*

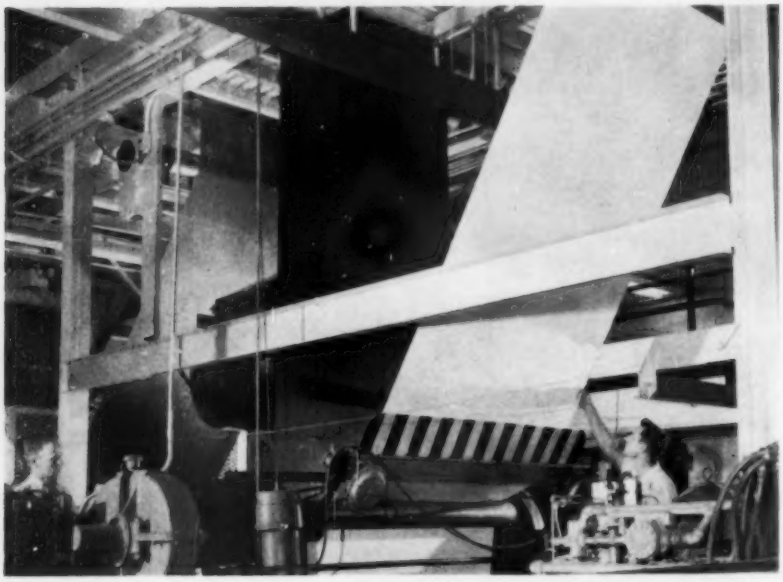
FOAM'S FUNERAL

Plant production men keep foam under control — never let it get away with all the trouble it could cause. But there is still the question: "How can it be stopped faster, more effectively and at lower cost?" Here's one answer:

In processing shelled peas and lima beans, Producers Service Corp., Benton Harbor, Mich., must keep foam down. If foam gets out of hand, the peas and beans float right out of the graders. Another reason for keeping foam at bay: If foam takes over, it's necessary to *(Cont. Pg. 2)*

FOR DATA RELATING TO THESE ARTICLES, CIRCLE REFERENCE NUMBER IN COUPON ON NEXT PAGE OR REFERENCE NUMBER ON READER SERVICE CARD

MORE



CURE FOR HEAT TROUBLES

Somewhere in almost every plant there's a bearing or some other moving part that gets too hot. Ordinary lubricants gum up or drip away and the bearing fails. Now there are oils and greases that won't gum . . . moving parts keep running. Witness this proof:

Like many other modern processing machines, the nylon treater at the Firestone Textiles plant in Gastonia, N. C. is huge, complex, and costly . . . often runs hot. It must pay for itself by operating constantly . . . around the clock. Any unscheduled stoppage costs big money. Ever since the treater was installed, some of its bearings — those in the quick-cooling fan — have been lubricated with Dow Corning 41 Grease and 710 R Fluid, both silicone materials. These bearings have always performed faultlessly, though constantly subjected to 350 F and occasionally to as much as 450 F. But a $5\frac{7}{16}$" roller bearing in the "turnabout" pillow block *did* fail. It was not silicone lubricated.

Firestone switched to Dow Corning Silicones in the pillow block, too. Results? They haven't had a failure since. Obviously, the story has a moral: When you have high temperature troubles with lubricants, send for a non-gumming Dow Corning silicone oil or grease. *No. 750*

DEFOAMER *(Continued)*

change the brine and that requires 14 bags of salt and 2 hours of labor.

Producers Service controls foam completely with a Dow Corning silicone defoamer. Five ounces of silicone emulsion prevent foam in the grader that handles 15 tons of peas per day. Foam can be much more severe in lima bean processing. Here only 20 ounces of water-dilutable silicone defoamer emulsion stop foam in 10 tons of shelled beans.

Which defoamer is the most effective? The one you're using may be doing a good job, but it may be possible to get even faster, more economical foam-killing action. Why not test Dow Corning silicone defoamers in your plant? They're safe, heat-stable, fast-acting, easy to use. That's why they are first choice in so many industries. *No. 749*

new literature and technical data on silicones

Surface-Maintenance Money Saver — Silicone-based paints provide up to 200% longer service life — greater protection. This brochure contains a new paint selector for choosing the best type of paint for every application . . . features case histories of equipment kept rust-free and attractive longer. Superior weathering properties, heat stability and resistance to corrosion are inherent characteristics of paints formulated with Dow Corning silicone resins. . . . *No. 751*

Pneumatic Grease Meets Specifications — Dow Corning 55 Pneumatic Grease is designed for dynamic lubrication between rubber and metal parts, between some bearing metals. Especially devised for aircraft pneumatic systems, 55 Grease meets the requirements of Specification MIL-L-4343A, Amendment No. 1. The wide temperature range and oxidation resistance of this silicone grease are discussed in . . *No. 752*

What, Why and Where — The full story on electric motors rewound with Dow Corning Silicones is told in this 4-page data sheet. A summary of what silicone insulation is, the benefits it offers, and an up-to-date listing of Dow Corning Authorized Service Shops are contained in this valuable data sheet . . . . *No. 753*

Ready-To-Use — Now a single component room temperature vulcanizing silicone rubber has been developed by Dow Corning. It is available for immediate application . . . for patching, sealing, and other maintenance jobs. Reacting to moisture in the air, Silastic RTV 731 cures at room temperature to a solid rubbery form. This data sheet gives details . . . . . *No. 754*

Forms, Properties, and Applications of Dow Corning Silicones are well-illustrated and supplemented with tables and graphs in the new guide to Dow Corning products. This 16-page reference covers production and maintenance materials that resist time, heat, cold, moisture, weathering, oxidation, and chemical attack. You might find the solution to your problems by writing for . . . . . *No. 755*

Dow Corning Corporation, Dept. 9605, Midland, Michigan
Please send me: 747 748 749 750 751 752 753 754 755

NAME _____
TITLE _____
COMPANY _____
STREET _____
CITY _____ ZONE ____ STATE _____

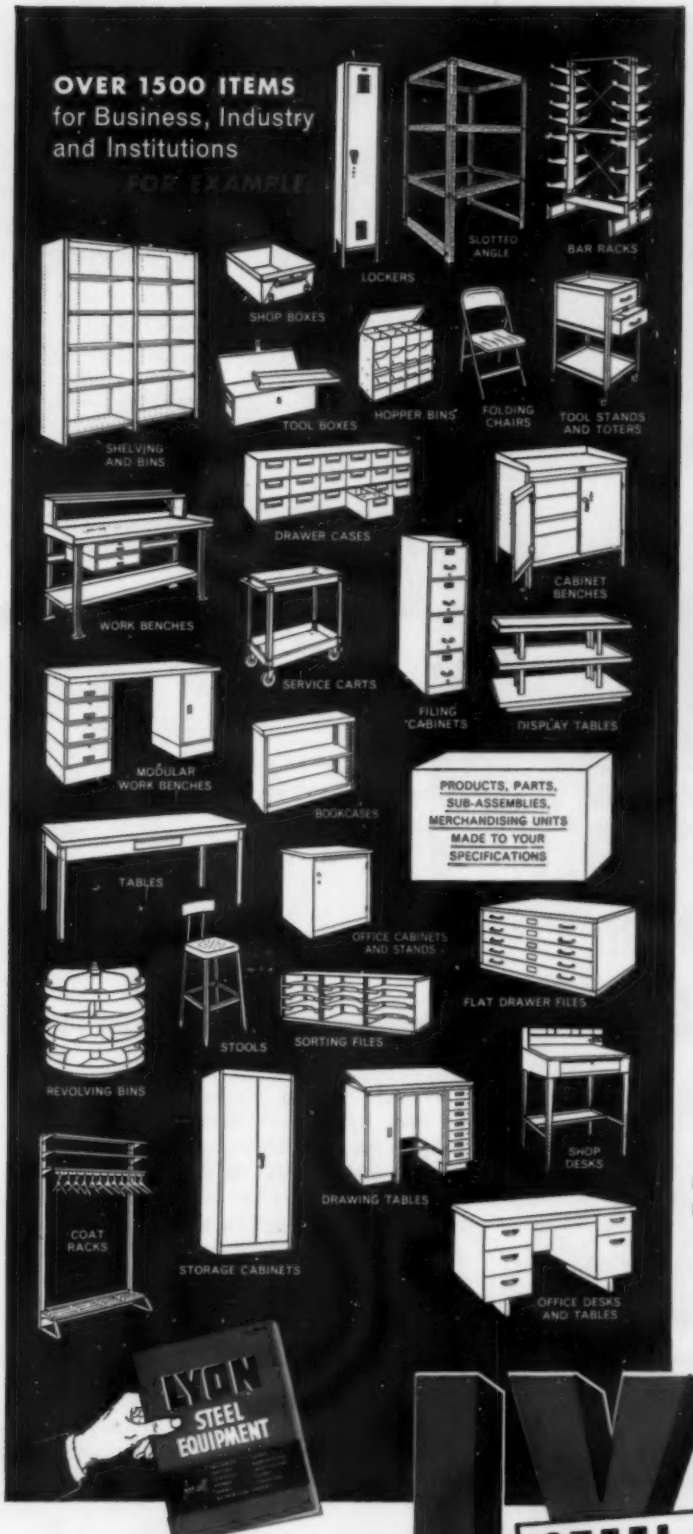
SILICONE NEWS is published for production and maintenance men by

first in silicones

Dow Corning CORPORATION
MIDLAND, MICHIGAN

ATLANTA BOSTON CHICAGO CLEVELAND DALLAS LOS ANGELES NEW YORK WASHINGTON, D. C.
CANADA: DOW CORNING SILICONES LTD., TORONTO GREAT BRITAIN: MIDLAND SILICONES LTD., LONDON FRANCE: ST. GOBAIN, PARIS

FOR DATA RELATING TO THESE ARTICLES, CIRCLE REFERENCE IN COUPON ABOVE, OR REFERENCE NUMBER ON READER SERVICE CARD



THIS CATALOG ILLUSTRATES
THE WORLD'S MOST
DIVERSIFIED LINE
OF STEEL EQUIPMENT
IT'S FREE!

DESIGN makes the DIFFERENCE

...and top design is one of many dividends when you buy

QUALITY PROTECTED LYON STEEL EQUIPMENT

THE "QP" ON EVERY LYON CARTON IS YOUR ASSURANCE OF QUALITY EQUIPMENT

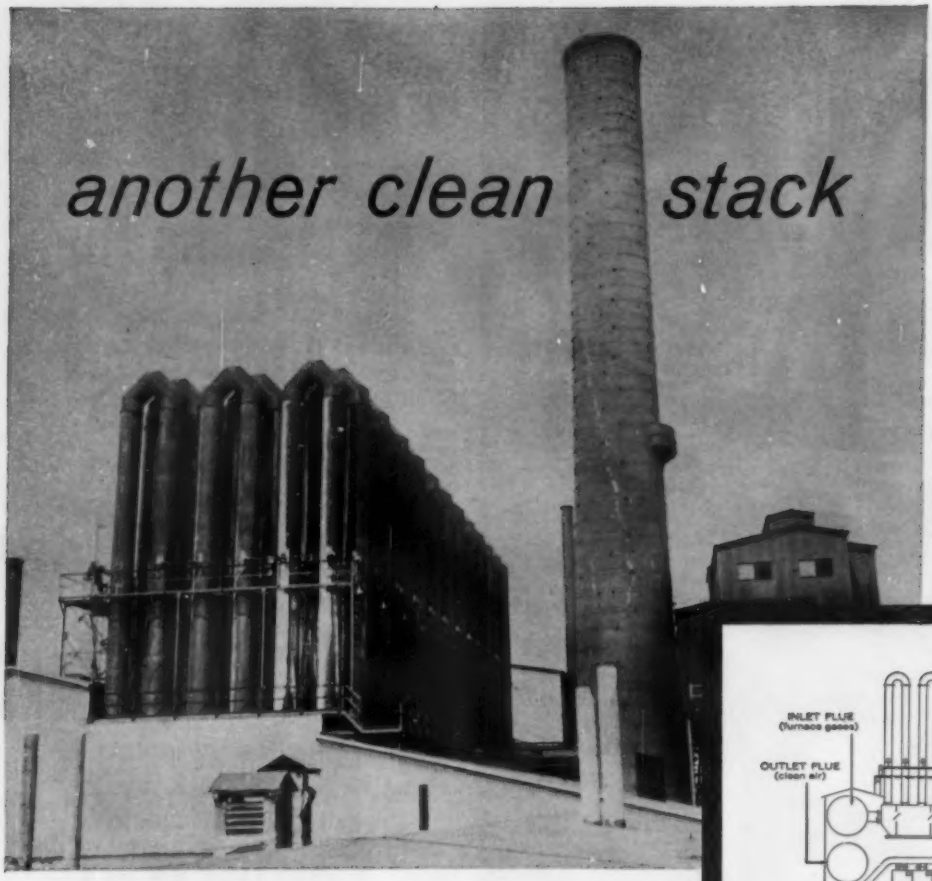
See your Lyon Dealer for delivery from stock of the world's most diversified line of steel equipment.

LYON METAL PRODUCTS, INC.

General Offices: 591 Monroe Ave., Aurora, Illinois
Factories in Aurora, Ill.—York, Pa.—Los Angeles
Dealers and Branches in All Principal Cities

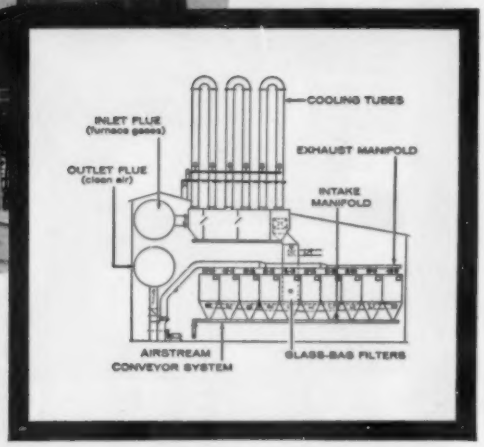
LYON®
STEEL EQUIPMENT

For more facts circle 600 on Reply Card



(Left) Cooling tubes atop Glass-Bag Filter housing lower furnace gas temperature from 800°F. to 450°, a full 150° below maximum advisable operating temperature. Clean stack proves that filter removes all visible dust.

(Below) System consists of 12 ten-compartment Glass-Bag Filters. Gases at 800° are blown from electrostatic precipitator to cooling tubes which discharge to filter system, resulting in daily collection of about 35 tons of material.



..."trade mark" of the Dracco Glass-Bag Filter

Freedom from hot, corrosive dust created by metallurgical processes is one of the many benefits of using Glass-Bag Filters. The clean stack shown in the unretouched photograph testifies to the effectiveness of the Dracco system at Hudson Bay Mining & Smelting Co., Ltd., Flin Flon, Manitoba.

Here is what the system does for Hudson Bay:

- **handles 450,000 cfm of mixed reverberatory furnace and converter gases at 450°F.**
- **recovers approximately 35 tons of valuable metal oxide dusts daily.**
- **maintains operating temperature to prevent condensation of exhaust gases and formation of corrosive acid dews.**
- **eliminates air pollution**
- **reduces cooling equipment requirements, and costs, by 50% over conventional methods.**
- **provides low-maintenance operation and gentle bag cleaning with SWING-CLEAN.**

Glass-Bag Filters, the most advanced equipment now available for fighting air polution and hot dust, have been proved-in-performance in the metallurgical, chemical and cement industries. Virtually 100% collection efficiency is maintained at temperatures to 600°F. Maximum bag life is assured by either of two patented cleaning devices: (1) a mechanism for dust removal by sonics and (2) SWING-CLEAN, gentle swaying action.

For full details on how Glass-Bag Filters can help you lick that hot dust problem, write: Dracco Division of Fuller Company, Harvard Avenue and East 116th Street, Cleveland 5, Ohio.

DRACCO *airstream* conveyors
dust control equipment

FULLER COMPANY

For more facts circle 601 on Reply Card

For more facts circle 602 on Reply Card ——→

HALLOWELL
SHOP EQUIPMENT

Rugged, functional, versatile . . .
custom in everything but price!

OPEN BENCHES

Arrangeable, changeable, economical. Rugged construction. 4 leg heights, 4 top materials, 4 lengths, 5 widths—the widest selection in the industry. Choice of top and base accessories.

CABINET BENCHES

Functional, good looking, plenty of protected storage space. 3 lengths, 4 top materials. Many interchangeable accessories.

UNIT BENCHES

Wide variety of arrangements and accessories. Versatile, interchangeable drawer or cabinet pedestals. 2 lengths, 2 widths, 2 heights, 4 top materials.

SHOP DESKS

Large, smooth writing surface. Drawers glide on bearings. Recessed pulls. Three standard models, plus K.D. parts for custom assembly.

STOOLS and CHAIRS

Great variety. Set-up or K.D. Fixed or adjustable heights. Tubular or channel legs. Steel or Presdwood and steel seats—round or contoured—revolving or stationary. Optional foam rubber seat and backrest covers available.

TOOL STANDS

Built to take a beating. Four sizes, with drawers, trays, cabinet bases. Drawers in single or double tiers. Available with steel or rubber casters.

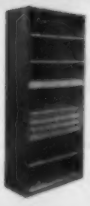
INDUSTRIAL CABINETS

Floor, wall and caster models. Safe, neat storage. Flush bases, detachable feet. Steel or rubber tread casters. Six sizes from 21 to 75 in. high.

STORAGE WALLS

Use individually or stack to form storage walls or partitions. Units available with 12, 16, 18, 24 or 32 drawers.

ERECTOMATIC® SHELVING



Exclusive features cut assembly time. Each shelf can be independently positioned. Stores up to 20% more in the same space. Interchangeable parts and accessories.

STEEL SHELVING

Use basic units individually or in combination. Ledge, counter and vertical types. Multiple pierced, precision formed for easy assembly.

MAIL COUPON TODAY

COLUMBIA-HALLOWELL Division SPS Jenkintown 26, Pa.

Please send me the Full Line Columbia-Hallowell Shop Equipment Catalog.

NAME_____
Please Print

COMPANY_____

ADDRESS_____

CITY_____ ZONE____ STATE_____

COLUMBIA-HALLOWELL Division **SPS** JENKINTOWN PA. • SPS WESTERN, SANTA ANA, CAL.

where reliability replaces probability

"BACKBREAKERS" wiped out by Budgit® Chain Blocks

Budgit Aluminum Army Type Chain Block. Integral push and hand-geared trolleys are adjustable to fit I-beams in a number of sizes. Low head-room design. Capacities: ¼ to 10 tons.
Budgit Aluminum Chain Block. Light in weight but tough. Can be carried to the job, hung up and operated by one man. Spark and corrosion resistant models. Capacities: ¼ to 2 tons. Hi-Cap® models from 3 to 10 tons.
Budgit Differential Hoist. Low-priced lifting tool for occasional use where high efficiency isn't essential. Light and compact. Capacities: ⅛, ½ and 1 ton.
Tugit® Lever-Operated Hoist. Light, compact, portable. Easy to operate even in close quarters at any angle. Fine for maintenance. Capacities: ½ to 3 tons.

Eliminate tough lifting and plant maintenance ceases to be a costly muscle-aching job. A large midwestern heavy machinery manufacturer found this only too true. So now Budgit Aluminum Chain Blocks in various capacities are proving to be the perfect answer to countless lifting problems.

These lightweight hoists are easy to get to the job — easy to rig and operate at any angle. These features alone have won wide favor among the maintenance men. For instance, troublesome occasional jobs — repairing furnaces, dismantling machinery, handling large pipe, motors or valves — demand shifting as well as lifting.

Budgit Chain Blocks are also solving handling problems at numerous metalworking machines. Here the number of lifts per day are few but accurate "spotting" of heavy loads is now being done without backbreaking hand chain pull.

Backsaving Budgit Chain Blocks can cut your maintenance costs and also boost your production efficiency. Ask your nearby Shaw-Box Distributors to help you select the types and capacities best suited to your needs. Or write for Bulletin 15025-1C.

*REGISTERED TRADENAMES 60 C-1

MANNING MAXWELL & MOORE TRADE MARK

BUDGIT CHAIN BLOCKS
A product of
MANNING, MAXWELL & MOORE, INC.
Shaw-Box Crane & Hoist Division • Muskegon, Michigan
In Canada: Manning, Maxwell & Moore of Canada, Ltd., Galt, Ontario

For more facts circle 603 on Reply Card

NOW . . .
REMOTE CONTROL
FOR WESTINGHOUSE
TYPES E, EH AND F BREAKERS

This magnetically operated unit turns your types E, EH and F breakers into a remotely controlled switch for—service entry panels—control panels—billboard, railroad yard, parking lot and industrial lighting systems. Use it as a remote switch for battery chargers—engine generators—you can think of a score of other uses.

□ This new Westinghouse Electric Operator is the same size and fits the same space as the breaker it controls. Its action is strong and positive, with the advantage of manual control when desired. In fact, this new electric operator does the same job for the smaller breakers that a motor operator does on the larger type breakers. What's more, the cost is much less. Electric operator works on 120, 240, 480 or 600 volts a-c; 125 volts d-c.

□ There's a 4-page, 2-color illustrated brochure available describing more about the Westinghouse Electric Operator. For your copy write: Westinghouse Electric Corporation, Standard Control Division, Beaver, Pa. J-30315

YOU CAN BE SURE...IF IT'S Westinghouse

For more facts circle 604 on Reply Card

NEW PRODUCTS AND PROCESSES summarized for your convenience

Edited by M. E. Heniken

It's easy to obtain product data with the postage-free Reader Service Cards provided on pages 295-296. Use them for information on advertised products, too. Just circle the key number appearing at bottom of the ad.

1—SPRAY UNIT for epoxy resin coatings

QuikSpray is a low-pressure, high volume air epoxy spraying gun unit claimed to spray materials of trowel consistency on floors and walls up to 10 times faster than by conventional application methods. It is designed to handle a wide range of materials including heavy-bodied epoxies, like company's Penntrowel, as well as plasters, stucco, colored aluminum and aluminum-filled roof coatings, epoxy-based materials, latex based materials,

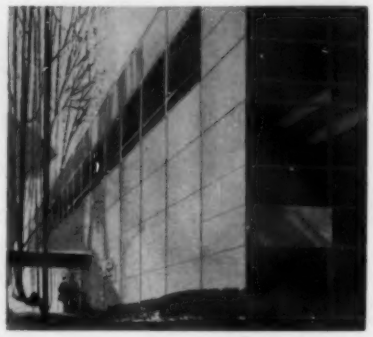
filled and non-filled epoxy resins. The unit makes possible faster and more economical application in larger areas.

Equipment is portable and has an output of up to 10 cfm. Snap connections for standard-sized air hoses, interchangeable orifices with rubber inserts facilitate maintenance and cleaning, it is stated—average cleaning time is 5 min. QuikSpray can be adjusted for gravity or pressure spraying. It includes interchangeable rubber nozzles, and three sizes of plunger air tips for various degrees of spray. The standard unit includes two aluminum 1½-gal, cone-shaped hoppers so that mixing and spraying can proceed without interruption. Power for a rotary type compressor is provided by a 2½-hp gasoline engine, or ½-hp electric motor. With low or no aggregate, the gravity method covers 8000 sq ft with a 1/32-in. coating in an 8-hr day. Using the pressure method with high aggregate, 5000 sq ft of 1/16-in. coating can be applied in the same period. Pennsalt Chemicals Corp.

2—WALL SYSTEM uses load bearing steel framing

Stran-Wall, a new concept in wall design for one- and two-story buildings, features a lightweight load-bearing steel structure, colorful porcelain curtain wall panels that slip into place on the structure itself, and aluminum extrusions and attachments—all in one package. Not a conventional curtain wall system, Stran-Wall is said to go up faster and easier and cost less. The steel framing is load-bearing, eliminating heavy structural beams and columns, manufacturer notes; and savings can be realized on foundations due to lightweight components, on materials due to low-cost steel construction, and on erection because of the simplicity of the system.

Framing is assembled by welding or self-tapping screws. Panels are slipped



into slots and grooves in the framing itself. A nailing groove in the framing makes it easy to attach collaterals to exterior or interior walls. Aluminum mullions, jambs, sills and headers are designed to be snap-fitted or attached by concealed screws. Stran-Steel Corp., Div., National Steel Corp.

3—INHIBITIVE PRIMER serves a double purpose

Bitumastic 11-S, a cold-applied, inhibitive primer for use in contaminated atmospheres, serves a dual role: as a shop primer, to prevent contamination from attacking the surface before the protective coating can be applied; to avoid undercutting where mechanical damage produces breaks in the protective coating, after applied. Tests are reported to show that results are good even where the surface preparation is less than ideal. No claim is made that it will penetrate heavy rust, manufacturer points out, but it has been successful in passivating the metal and preventing further development of rust tubercles. Koppers Co., Inc.

4—COLORED TAPE for coding, identification

Colored Temp-R-Tape is 0.006 in. thick, has an appliable temperature range from —100 to 400 F, it is announced, with high dielectric strength, low power factor and negligible moisture absorption. Specifically designed for color coding in electrical applications, this Teflon tape also has application as a non-stick, low friction surfacing where identification by color is desired. Ten bright colors are available. The tape can be had by the lineal yard, 12 in. wide, or in 18-yd rolls in widths from ¼ to 2 in. A ¼-in. roll costs around $5.25. The Connecticut Hard Rubber Co.

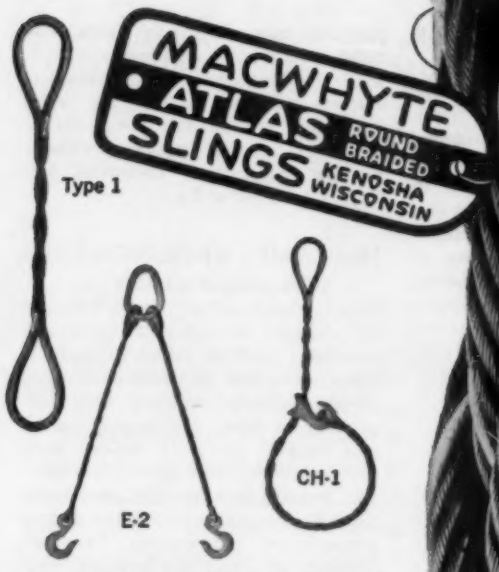
5—HOLLOW SPHERES control plating fumes, mist

Go-Mist Balls, a new approach to low-cost fume and mist control in metal plating and pickling operations, are molded of Super Dylan, a high-density polyethylene. In plating operations they are claimed to show no deterioriating at normal tank temperatures; in pickling, tests are reported to show their surface hardness unaffected after 3 mos in 10 per cent aqueous solutions of hydrochloric and sulfuric acids at 116 to 211 F. Discoloration does not reduce the effective life of these balls, manufacturer states, but nitric acid baths shorten their life and are not recommended.

In use, these balls nest tightly to form a blanket covering about 95 per cent of the surface area. They trap

gas bubbles, which are smothered against the underside of the balls, thus preventing mists from escaping. Evaporation loss of chromic acids is said to be cut by as much as 30 per cent, and undersirable fumes by about 87 per cent. Also, Go-Mist Balls help

For more facts circle 605 on Reply Card ——→



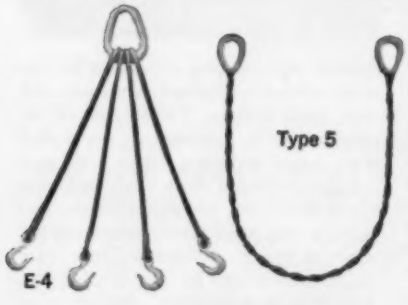
You get a wide choice of sizes, types, and fittings!

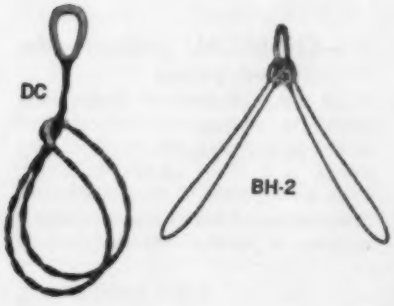
Pictured here are just a few of the many types of braided Atlas Slings readily available from Macwhyte. You can order standard designs from the Macwhyte Sling Catalog, or Macwhyte engineers will design slings to meet your special loadlifting requirements.

The eight-part Atlas Sling is made by custom braiding two endless Monarch Whyte Strand wire ropes — one right lay and one left lay. This produces an unusually flexible, light-weight, perfectly balanced sling in which all ropes react the same under load.

The Macwhyte Atlas Sling hugs the load with a safe, full-grip contact . . . and the braided construction resists kinking and speeds handling. Ask for sling circular 5308, free on request.

212





ATLAS SLINGS ARE VERSATILE!

MACWHYTE

Wire Rope COMPANY

2900 Fourteenth Avenue, Kenosha, Wis., U. S. A.
Wire Rope • Slings • Cable Assemblies

NEW PRODUCTS

(Begins on page 216)

maintain uniform temperatures. About 55 balls per square foot are required for adequate tank surface coverage. Cosum Engineering Corp.

6—EPOXY COMPOUND for floor topping, patching

Thiopoxy 60 is a two-component compound containing flexible Thiokol, liquid polymers and epoxy resins designed to withstand severe corrosive and abrasive conditions. It is a one-application compound applied by trowel, to a ⅛-in. thickness or more, and finished by mohair paint roller, to interior or exterior new or old concrete. It is said to cure overnight, at normal room temperatures, to a dense, slip-resistant, non-shrinking, topping offering both impact and abrasion resistance. Manufacturer says it is virtually non-porous, dustless, sanitary, of great flexural and compressive strength, and resistant to over 70 chemicals. It is suggested for repairing cracks and grouting joints of acid-proof brick and quarry tile floors, and as a covering on adjoining vertical surfaces, curbing, acid trenches and solvent or alkali sewers. Available in grey and tile red, Thiopoxy 60 is packaged in units, each consisting of base compound and catalyst, premeasured in correct proportions for mixing at job site. A. C. Horn Companies, Div., Sun Chemical Corp.

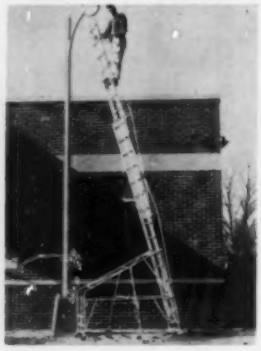
7—SAFETY TREAD restores worn, slippery stairs

Super Stairmaster Treads are 9 in. wide with beveled back; they fit steps up to 13 in. wide. Base of the tread is a

heavy-duty aluminum with ribs of hard abrasive to provide an anti-slip walking surface. Lengths to 12 ft are available. Fasteners are furnished for installating on various types of stairs. To restore stairs, you trowel a suitable plastic leveling compound over the worn areas to return the step to a level surface. The step is then capped with the heavy-duty Super-Stairmaster Tread. Wooster Products Inc.

8—HIGH-REACH LADDER straddles the obstacles

Bally-Hi consists of a 28-ft two-stage ladder mounted on a wheeled frame equipped with collapsible outriggers. Its construction permits it to straddle seats in auditoriums, machinery in plants, desks or furniture in offices, etc. Aluminum extension ladder consists of two 14-ft sections, reaching to heights 30 ft, with guard rails along entire ladder length and a pulpit-type



guard rail at top. Supporting frame glides from one job to another on large 4-in. swivel type casters. Locking device anchors frame to ground when ladder is stepped on. Overall collapsed height of entire unit is 77 in., permitting easy moving even through ordinary size doorways. Ballymore Co.

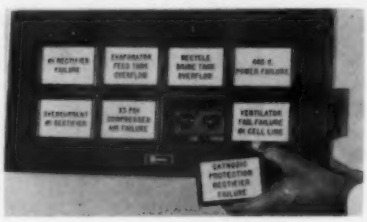
9—MANUAL DOCK RAMP has an automatic lip

This frame-contained, spring counterbalanced, dock leveling ramp is manually operated, but has an automatic lip. The complete unit installs in a recess only 74-by-24-by-86¾ in. Platform size is 6 ft wide, 8 ft long, including hinged lip section. Lip travel is 11 in. below to 30 in. above dock height. When not in use, the 20,000-lb capacity ramp is horizontally locked to the level of the surrounding dock area. The lip section points down, propped against a bracket on the frame. To actuate the ramp, you trip a cord release mechanism. As the platform rises, the lip section thrusts forward. Then you step on the platform to depress it and cause the lip to rest on the carrier bed. As soon as the carrier pulls away, the platform rises and the lip drops. The ramp is manually depressed to dock level. The retractable lip feature lets carriers park up against the ramp overnight, and enables ramp adjustment to loading position without moving the carrier. Industrial Lift Div., Globe Hoist Co.

10—LAMP ANNUNCIATORS with plug-in circuits

Plug-in circuits which can be removed and changed for different operational sequences, multiple lamps to assure a signal in event of burn-out, quick change "snap-in" indicator plates, sequential circuits, data-logging terminals, snap-fit one-piece molded lamp compartments removable without tools, are among features announced for these flexible, modular industrial lamp annunciators and systems. They are designed to detect and indicate, visually and audibly, any abnormal condition or change in status; then, based on information received, to start up or shut down any desired machinery; to feed information to data-logging or other control equipment; and finally, to reset themselves.

Among functions of the units are monitoring of pressure, temperature, opening of circuit breakers, high or low liquid levels, power equipment failure or any break in an electrical circuit. Included in the equipment line are all basic components of a system: lamp indications, "plug-in" circuits,



audible signals, plus provision for remote acknowledgement, lamp test and reset push buttons. Three types of reinforced steel cabinets are available: flush panel mounted types with rear access terminals; flush wall mounted types with front access terminals; and surface mounted types with front access terminals. Indicator sizes vary from 1-by-3 in., to 1½-by-2 in., to 2-by-3 in. Edwards Co., Inc.

11—CHEMICAL protects the oil-fired boilers

Nalco 159, a combustion chemical designed to protect residual oil-fired boilers against slag and cold-end corrosion, is a clear, oil-soluble liquid. Tests are reported to show it effective in protecting air heater and economizer sections of residual oil-fired boilers,

For your next building . . . . . Color? Configuration? Single Wall? Sandwich Wall? Insulated Panels?

Your selection and procurement are simplified by investigation of EGSCO metal wall products. They comprise a complete range of sheet and panel configuration, a usable variety of baked-on, durable enamel colors, and a practical assortment of wall components in your choice of aluminum or steel.

EGSCO metal wall products are engineered for sound building construction with an economy attained through improved erection techniques, reducing erection time.

EGSCO metal wall quality and practicality have been built upon the experience of years in actual building design and erection. Thousands of EGSCO buildings from coast to coast attest these attributes.

Finally there is this plus: EGSCO erection crews have the experience and know-how to erect any of these wall combinations quickly, soundly and at a realistic cost, where this service is desired.

Here's how you can contact the nearest district office of Elwin G. Smith & Co., Inc., manufacturers of EGSCO metal wall products:

Boston	CEdar 5-1924
Chicago	KIngswood 3-3350
Cleveland	JAckson 6-4332
Detroit	Toledo, Ohio GReenwood 4-8198
New York	Clifton, N. J. PRescott 3-3313
Philadelphia	OLdfield 9-6655
Pittsburgh	POplar 1-7474
Toledo	GReenwood 4-8198

See these EGSCO products in Sweet's:

Architectural File:	Industrial Construction File:
Curtain walls 3a/Sm	Curtain walls 3a/Sm
Sandwich walls 8b/Smi	Sandwich walls 8b/Smi
Corrugated sheets 8b/Sm	Corrugated sheets 8b/Sm
Roof Deck 2c/Sm	Curved conveyor hoods 8b/Sm
Steel forms for concrete roof and floor slabs 2a/Sm	Roof Deck 2d/Sm Steel concrete forms 2b/Sm

Copies of these catalogs may be obtained from the nearest office of:

ELWIN G. SMITH & CO., INC.

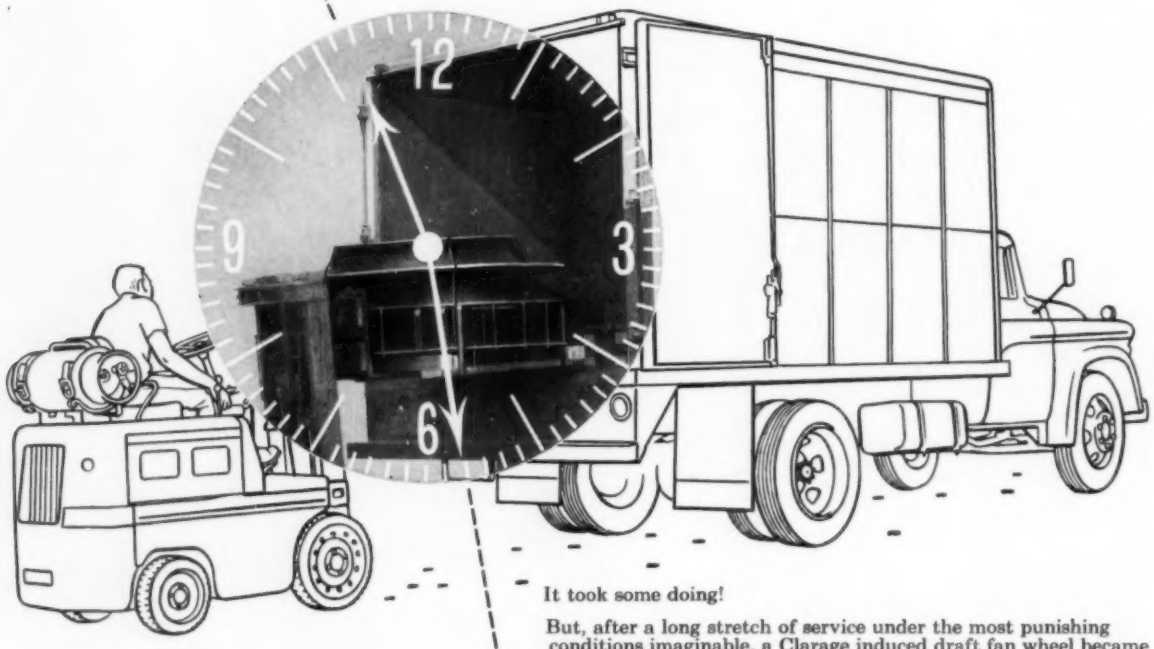
Manufacturers of EGSCO® Metal Wall Products

Pittsburgh 2, Pa.

For more facts circle 606 on Reply Card

CLARAGE

....exceptional service measured by the customer's clock



In just 30 hours this Replacement Fan Wheel was built and on its way!

It took some doing!

But, after a long stretch of service under the most punishing conditions imaginable, a Clarage induced draft fan wheel became worn out by corrosion.

This fan's operation was vital to both the customer and the insurance company whose business interruption policy was in effect. Prompt replacement of the wheel was imperative.

Here, too, it took some doing!

The original hub was returned to Clarage by air at 10 a.m. on Tuesday. Manufacture of the rest of the wheel had already begun. Thirty hours later—at 4 p.m. on Wednesday—a new 1300 pound precision built wheel and 400 pound inlet cone were being loaded at the Clarage plant for delivery to the airport.

Back at the customer's plant a Clarage service representative was ready for the arrival of these replacement parts. His on-the-scene assistance expedited the return to operation of the fan.

Result: another customer (plus an insurance company) impressed by Clarage's all-out service.

Dependable equipment for making air your servant

CLARAGE FAN COMPANY

Kalamazoo, Michigan

For more facts circle 607 on Reply Card

NEW PRODUCTS

(Begins on page 216)

and in reducing fouling by slag throughout the furnace. It protects boiler fireside surfaces by interrupting high temperature reactions that cause oil ash constituents to form slag, manufacturer states, and it poisons catalytic surfaces that help form sulfur trioxide. Nalco Chemical Co.

12—INDICATOR LAMP has greatly increased life

This low-cost, electronic indicator lamp is announced as having a rated life of 3000 to 5000 laboratory test hours—10 times greater than competitive lamps. Included in the product combination are a redesigned short base indicator lamp, plastic color lamp caps, multi-socket strips for panel

mounting, and single sockets. A flat top end construction permits relocation of the filament, increasing end foot candles to provide up to 60 per cent more light. These lamps come in seven standard sizes from 4 to 28 v. Other voltages can be ordered. Standard current ratings are 35 to 45 ma. End foot candles of illumination range from 200 for the 4-v lamp to 1285 for the 28-v lamp. Sylvania Electric Products Inc.

14—ALUMINUM SHEET for re-roofing and siding

Announced as a low-cost, lightweight aluminum sheet primarily for re-roofing and siding. Twin-Rib is diamond embossed with a pair of rib-shaped corrugations spaced 8 in. on center. Flat areas between ribs are approximately 5 in. wide. Designed for direct application over an old roof or solid sheathing, the twin ribs provide strength where it is needed to support weight of workmen, company says, and flat surfaces of ribs offer ideal nailing surface for tight eaves, endlaps and ridges. Deep ribs and wide troughs also provide for heavy run-off of rain. Accessories available include ridge cap, end wall flashing, closure for plain ridge, corner posts and gable trim. Kaiser Aluminum & Chemical Corp.

15—FAST STRIPPER removes organic coatings

Speedi-Strip No. 1010 is announced as a non-flammable, bond releasing stripper for removing epoxies, acrylics, alkyds and baked enamels from aluminum, copper, brass, steel and stainless steel. Speedi-Strip, according to company, does not deteriorate, and requires additions only in case of drag-out. Once the bond is broken, the coating flushes off with water. Industrial Chemical Div., ESBEC Corp.

13—ULTRASONIC DEVICE detects bubbling in liquids

The Taylor Ultrasonic Bubble Detector is designed to detect undesirable or controlled bubbling in almost any liquid—flowing or static—in open or closed vessels, pipes or flumes. It can be coupled with indicating, recording or controlling instrumentation, or simply with an alarm. Experimental use has been with bubble detection in film emulsions, lubricating oils, water etc. Other possible uses suggested by manufacturer include automatic inspection for leaks in radiators or any closed vessels which can be submerged in water and filled with air. The detector can be used with hard-to-handle liquids, it is stated, and it detects individual bubbles as readily as large quantities. Strength of output signal varies with both size and number of bubbles.

Sensing head assembly, at the process, is cable connected in a continuous loop with amplifier unit, which may be remotely located. A pulsed ultrasonic signal passes through the liquid which is likewise flowing between transmitter and receiver heads. The presence of bubbles weakens or interrupts the signal. No air supply is required for instrument operation and a noteworthy safety factor is use of a non-radioactive power source. Technical Sales Letter 6 and Bubble Detector Flow Data sheet give further details. Taylor Instrument Companies.

16—CAULKING COMPOUND is versatile, long lasting

Poly-Flex is a Thiokol-epoxy base caulking compound. According to manufacturer, this synthetic plastic-rubber material is acid-alkali proof. has unusual sealing characteristics and elasticity, and tenacious adhesion to wood, metal, glass and plastics. Applications include curtain wall construction, sealing, caulking, glazing and waterproofing. It sets up overnight and is non-shrinkable, company states; and remains unchanged when exposed to air, moisture, salt spray and sunlight. Tests of Poly-Flex are reported to show resistance to contraction and expansion, vibration, extreme temperature changes and aging. Long range economy is stressed, due to its longer service life. Guardian Industrial Products Inc.

17—TEACHING DEVICE reduces training time

The Atronic Tutor is described as a simple, reliable, all-mechanical unit about the size of a small adding machine, which presents step-by-step text material to student or trainee at a rate corresponding to his ability to absorb it. The Tutor also tests student on the subject matter, and measures his progress. (In addition to this device, company provides consulting services for designing, installing, and evaluating mechanized programs to help solve industrial training problems, and if desired, custom-prepared machine texts.) The Atronic Tutor is used in a two-part learning system, in which a text contains the subject matter organized in a series of graded steps or incre-

ments, with question or problem and set of alternative answers on each page. If the student presses the key designating the correct answer the Tutor turns the pages to the next step to be learned. General Atronics Corp.

18—PLASTIC PAINT for one coat application

Poly-Wall is announced as a one-coat, self-sealing acrylic copolymer vinyl flat wall finish which can be used over new plaster, wall board or previously painted surfaces, is odorless and dries flat in less than 2 hr. Applied with

NEW PRODUCTS

(Begins on page 216)

brush, roller or spray, Poly-Wall is said to blend without lap marks, have long "mileage," good hide and workability, stand up under repeated scrubbings, and due to its alkali resistance, be usable on fresh plaster. Company says it can be washed with soap and water. Mathews Paint Co.

Reader Service Cards on pages 295-296 make it easy to get further information on any of these products. Just circle the item numbers of the products you would like to know more about.

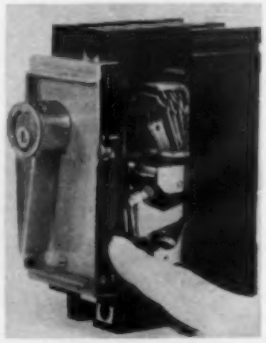
19—BIG CAPACITY TRUCKS to haul the heavy loads

Two 22,000-lb capacity models are recent additions to company's G-5 line of cushion-tire, gas-powered industrial trucks for in-plant handling of heavier loads. One truck is rated at 22,000-lb capacity at a 24-in. load center. Comparable in compact size with the 20,000-lb capacity G-5, it handles conventional, heavy loads. Overall length is just 125¼ in. from face of fork carriage to rear of counterweight, and turning radius is 110 in. The second new model is rated at 22,000 lb at a 27-in. load center, and has a turning radius of 122 in. Full capacity here is achieved by extending the wheelbase 12 in.

Rugged construction and fast rate of cyclic operation are announced for these trucks. Despite their high load rating capacity, these trucks lift at full speeds to 45 fpm. Both power steering and power assisted brakes are standard. Also standard is the safety seat which applies brakes when operator leaves the seat. The Yale & Towne Mfg. Co.

20—CIRCUIT BREAKERS with integral rotary handles

Maximum safety, ease of installation and reliable operation are attributed to integral rotary handles on these molded case circuit breakers. The line includes 15- to 100-amp 480-v EF frame breakers, 15- to 225-amp 600-v F frame breakers, 70, to 400-amp 600-v J frame breakers, and 125- to 800-amp 600-v M frame breakers. These units can be used in switchboards, control centers, panelboards, control panels and individual enclosures. Since the rotary operating handle is an integral part of the breaker, there's no external linkage,



breaker misalignment or false indication of breaker contact position.

Safety features noted include a voidable interlock permitting enclosure door to be opened for inspection when handle is in "on" position without sacrificing the locking features of the breaker handle itself. Manufacturer points out that a locking ring capable of accommodating three padlocks, and a cylinder-type lock which locks breaker in either open or closed position are effective whether enclosure door is open or closed. The new line also features modular design (multiples of 1⅜ in.). Breakers may be coordinated and assembled with each other as well as with company's molded case toggle handle breakers, PMS panel mounting motor starter units, and QMQB fusible switches. Federal Pacific Electric Co.

21—WALL CLEANER is air powered, fast, quiet

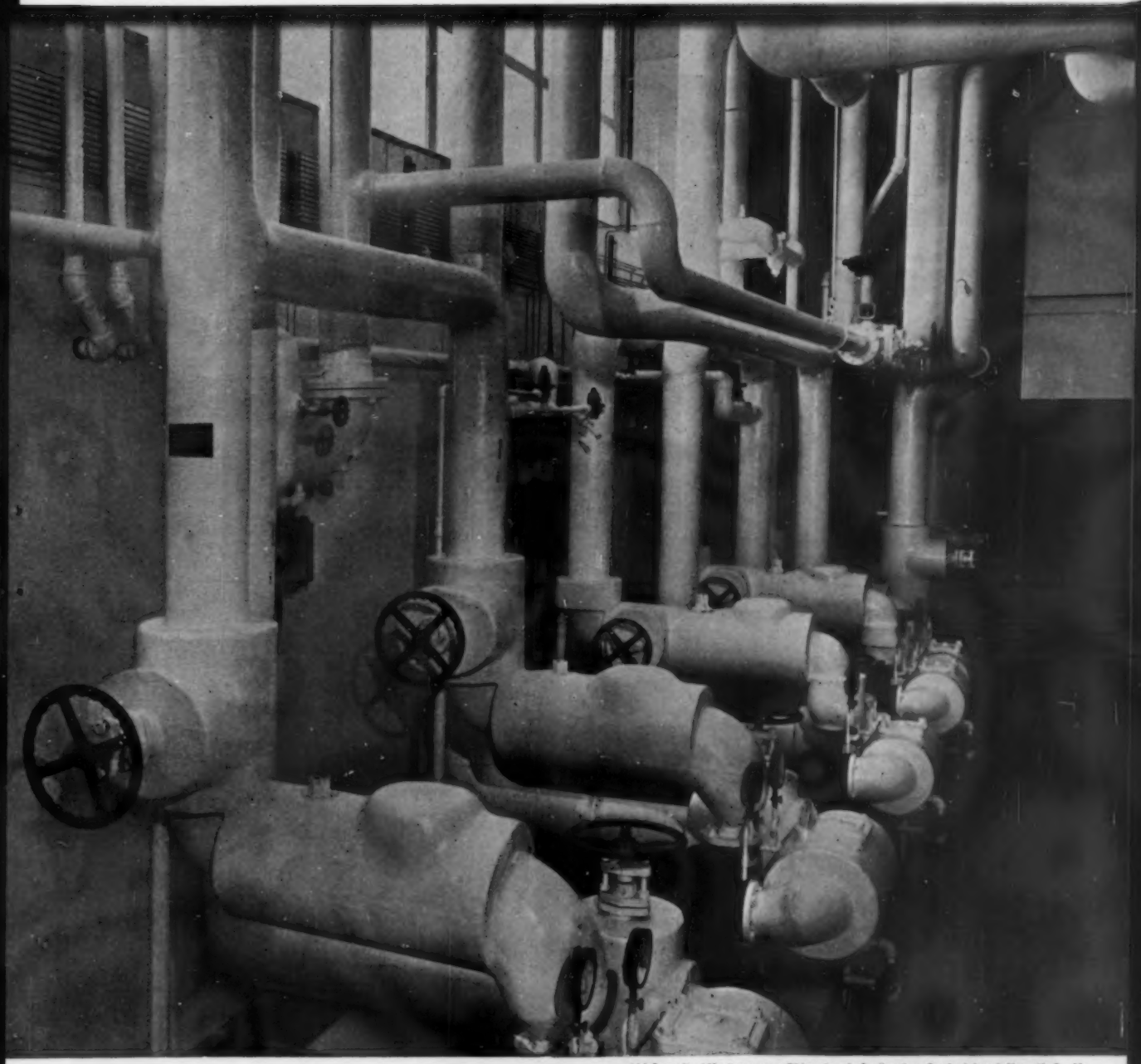
Wall-O-Matic is announced as a noiseless machine utilizing compressed air to clean walls and revitalize painted surfaces without drip or streaking or need for drop cloths. It is said to clean walls in a fraction of the time usually required, and may be used without disturbing normal activity. The machine, using a special cleaning solution, may be used on all types of walls, including plaster, painted, brick, stippled and many types of acoustical

G-B SNAP*ON DISTRIBUTORS

LISTED IN YELLOW PAGES

(See ad on facing page)

AKRON, Ohio, The Asbestos Supply Co.
ALBANY, Ga., Industry Insulation Co.
ALBANY, N. Y., Hudson Valley Asbestos Corp.
ALBUQUERQUE, N. M., Mt. States Insulation Co.
AMARILLO, Tex., McDonald Engineering & Insulating Co.
ATLANTA, Ga., Reynolds Aluminum Supply Co.
AUSTIN, Tex., Cinbar Engineering Co.
BALTIMORE, Md., Leroy Insulation Co.
BANGOR, Me., Eastern Glass Co.
BATON ROUGE, La., Eagle Asbestos & Pkg. Co.
BEAUMONT, Tex., Solar Supply Co.
BILLINGS, Mont., Big Horn Supply, Inc.
BIRMINGHAM, Ala., Reynolds Aluminum Supply Co.
Shook & Fletcher Supply Co.
BORGER, Tex., Western Chemical Co.
BOSTON, Mass., Homans-Kohler, Inc.
BUFFALO, N. Y., Industrial Insulation Sales, Inc.
CHAMPAGNE, Ill., Lewie David Co.
CHARLESTON, W. Va., Asbestos & Insulating Co.
CHARLOTTE, N. C., D&B Insulation Co.
CHICAGO, Ill., E. C. Carlson Co.
Culberg Asbestos & Cork Co.
CHILLICOTHE, Ohio, Southern Ohio Insulating Co.
CINCINNATI, Ohio, R. E. Kramig Co.
CLEVELAND, Ohio, Ohio Asbestos & Insulation Co.
COLUMBIA, S. C., Industrial Insulation Div. of
Richland Oil Co.
COLUMBUS, Ohio, Santeler Brothers
Culberg of Ohio
CORPUS CHRISTI, Tex., Precision Insulation Co.
DALLAS, Texas, Acme Insulation & Supply Co.
DAVENPORT, Iowa, Republic Electric Co.
DAYTONA BEACH, Fla., B & F Insulation Co.
DENVER, Colo., Gene Wright Lumber Co.
Powers Industrial Insulation, Inc.
DES MOINES, Iowa, Iowa Asbestos Company, Inc.
DETROIT, Mich., The Walter Rankin Co.
ERIE, Pa., Laco-McMullen Co.
EVANSVILLE, Ind., George Koch Sons, Inc.
FALCONER, N. Y., Laco Roofing
FT. SMITH, Ark., Gunn Distributing Co.
FT. WAYNE, Ind., M. H. Hilt, Inc.
FT. WORTH, Tex., Bracken Co.
GREENSBORO, N. C., Starr Davis Co., Inc.
GULFPORT, Miss., Paine Supply Co.
HOUSTON, Tex., Precision Insulation Co.
INDIANAPOLIS, Ind., Lyon Lumber & Supply Co.
JACKSON, Miss., Paine Refrigeration & Supply Co.
JACKSONVILLE, Fla., Eckies Distributors, Inc.
Reynolds Alum. Sup. Co.
JOPLIN, Mo., Joplin Cement Co.
KANSAS CITY, Mo., Central Supply Co.
KEWANEE, Ill., Mechanical Insulation Co., Inc.
LAKE CHARLES, La., Solar Supply Co.
LITTLE ROCK, Ark., Gunn Distributing Co.
LOS ANGELES, Calif., Western Fibrous Glass Prod. Co.
LOUISVILLE, Ky., General Insulation & Roofing Co.
MACON, Ga., Industry Insulation Co.
MARIETTA, Ohio, Asbestos & Insulating Co.
MEMPHIS, Tenn., John A. Denie's Sons, Co.
Gibbons Supply Co.
MIAMI, Fla., Reynolds Aluminum Supply Co.
Southern Metal Products Co.
MILWAUKEE, Wisc., F. R. Dengel Co.
MINNEAPOLIS, Minn., Asbestos Products, Inc.
MOBILE, Ala., Shook & Fletcher Insulation
MONTGOMERY, Ala., Shook & Fletcher Supply
MOORHEAD, Minn., Fargo-Moorhead Insulation Co.
NASHVILLE, Tenn., Reynolds Aluminum Supply Co.
NEWARK, N. J., Eastern Steam Specialty Co.
NEW ORLEANS, La., Eagle Asbestos & Packing Co.
NEW YORK, N. Y., Eastern Steam Specialty Co.
ODESSA, Tex., Western Chem. & Supply
OKLAHOMA CITY, Okla., Ball Distributing & Engr. Co.
OMAHA, Nebr., Cardinal Supply & Mfg. Co.
ORANGE, Conn., Insulation Supply Co.
PADUCAH, Ky., Triangle Insulation Co.
PHILADELPHIA, Pa., John F. Scanlan, Inc.
PHOENIX, Ariz., Kircher Asbestos & Rubber Co.
PITTSBURGH, Pa., Keystone Div. of Dravo Corp.
PORTLAND, Me., Eastern Glass Co.
PORTLAND, Ore., Western Fibrous Glass
RALEIGH, N. C., Reynolds Aluminum Supply Co.
RAPID CITY, S. D., Robbins & Stearns Wholesale
RICHMOND, Va., Reynolds Aluminum Supply Co.
ROANOKE, Va., C. E. Thurston Co.
ROCKFORD, Ill., Mott Brothers Co.
SALT LAKE CITY, Utah, Bullough Asbestos Sup. Co.
SAN ANTONIO, Tex., San Antonio Machine & Supply Co.
SAN DIEGO, Calif., Western Fibrous Glass Prod. Co.
SAN FRANCISCO, Calif., Western Fibrous Glass Prod. Co.
SAVANNAH, Ga., Reynolds Aluminum Supply Co.
SEATTLE, Wash., Western Fibrous Glass Products Co.
SHREVEPORT, La., Frith Sales Co.
SOMERVILLE, Mass., Insulation Products, Inc.
ST. LOUIS, Mo., The Stovey Company, Inc.
ST. PAUL, Minn., Asbestos Products, Inc.
SULLIVAN, Ill., Lewie David, Inc.
SYRACUSE, N. Y., Burnett Process, Inc.
TAMPA, Fla., Eagle Roofing & Art Metal Works, Inc.
TULSA, Okla., Ball Distributing & Engr. Co.
TUPELO, Miss., Paine Supply Co.
WASHINGTON, D. C., Walter E. Campbell Co., Inc.
WEST PALM BEACH, Fla., Southern Metal Prod.
WICHITA, Kans., General Metals, Inc.



Old Security Life Insurance Bldg., Insul. Contractor: Central Insulation, K. C., Mo.

When appearance is also important . . . specify G-B SNAP*ON®

FOR AN ATTRACTIVE, FINISHED PIPE INSULATION JOB, SPECIFY G-B SNAP*ON—the original one-piece pipe insulation molded of fine glass fibers. On the job shown above, canvas-covered G-B SNAP*ON was applied and then painted. As you can see for yourself, the end result is an immaculate-looking network of insulated pipe. And G-B SNAP*ON is as thermally efficient as it is neat in appearance—usually requires less thickness than other general purpose pipe insulations to provide specified thermal efficiency.

In addition, G-B SNAP*ON is economical, because it can be easily and quickly snapped over pipe in one effortless motion. Because it is made entirely of glass fiber, G-B SNAP*ON is less susceptible to damage, easier to handle—and there's less waste! G-B SNAP*ON is available in 3′ (as used in the job above) and 6′ sections for cold and hot lines up to 350°, indoors or out—plain or with a variety of factory-applied facings.

FOR INFORMATION AND DELIVERY CALL YOUR LOCAL G-B SNAP*ON DISTRIBUTOR (LISTED IN ADJOINING COLUMN)

GUSTIN-BACON *Manufacturing Co*

232 W. 10th Street, Kansas City, Missouri

Thermal and acoustical glass fiber insulations . . . Molded glass fiber pipe insulation
Couplings and fittings for plain and grooved end pipe

For more facts circle 608 on Reply Card

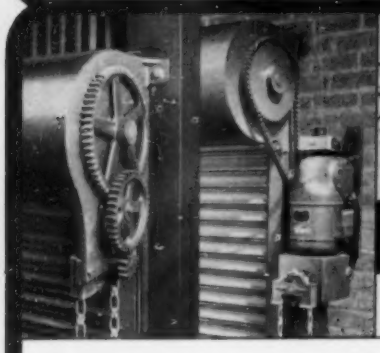
MAHON ROLLING STEEL DOORS

. . versatile space-savers, efficient cost-cutters that . . .

. . fit any opening, any application, any type installation . . .

. . suit any surroundings—industrial, commercial or institutional . . .

. . work with a quick vertical roll-up action, and out-of-the-way storage . . .



. . easy operation in either mechanical- or power-operated types . . .

. . in standard or special models, plus Underwriters' labeled types . . .

. . . quality made with Bonderized curtain slats for long life . . .

. . . completely described in Catalog G-60. Write for it or See Sweet's File.

other Mahon building products—
Curtain Wall, M-Floors, Long-Span M-Deck, Steel Roof Deck. Acoustical Metal Walls.

Mahon construction services—
Structural Steel—Fabrication and Erection; Steel Fabrication—Weldments and Assembly.

THE R. C. MAHON COMPANY
Detroit 34, Michigan
Manufacturing Plants—Detroit and Torrance, Calif.
Sales-Engineering Offices in Detroit, New York, Chicago, Torrance and San Francisco.
Representatives in all principal cities.

MAHON

For more facts circle 609 on Reply Card

NEW PRODUCTS

(Begins on page 216)

ceilings. The portable unit does not require special operator training. A spray nozzle attachment cleans hard-to-get-at places and irregular shaped objects such as pipes, woodwork, etc. Central States Maintenance Co.

22—GATE VALVES offer safety, maintenance benefits

Bronze gate valves in this series contain built-in safety features and performance characteristics designed to make them especially suited for applications in the 125 to 150 psi steam-pressure range. Maintenance

and safety advantages are attributed to three design elements: union bonnet, reinforced body, and cylindrical body neck section. Also, the chamfered opening inside the top of the body provides more working room for positioning the discs on the guide when assembling the valves. Long pipe threads in the valve body serve to permit tight valve-to-pipe jointing, without risk of pipe crowding and disc distortion.

One valve in the series, Figure 3125, has double wedge disc and rising stem. Figure 3127, with solid wedge disc and rising stem, is suggested for food processing services and lines handling gummy and tacky substances. Figure 3129, with single-wedge disc and non-rising stem, is for installation where overhead space limitations rule out use of a rising-stem type valve. Lunkenheimer Co.

23—A-C DRIVES offer economical speed control

Economical, adjustable-speed a-c drives in the Magnaflow line are of integral-unit construction, rated from ¼ to 100 hp. (Larger drives with separate motor mounted on a bedplate are offered up to 700 hp liquid cooled. Simple control modifications to provide a variety of speed operating functions are also available.) This

Couplings and fittings for plain and grooved end pipe

THE V IS THE THING

25% UPLIGHT

BETTER LIGHTING QUALITY
BETTER WORKING ATMOSPHERE
10% BETTER MAINTENANCE

GUTH WYTELINER INDUSTRIALS

Their V-shaped center reflector can't trap dirt or dust. Therefore, it stays clean far longer than flat-center reflector units.

Guth 25% Uplight fixtures produce powerful downlighting and afford 27° normal shielding. They wash away gloom and overhead shadows, improve eye comfort and working conditions . . . assure maximum lighting efficiency, plus less maintenance, even under the poorest area conditions.

Units available for 430, 800 or 1500 M. A. operation.

WRITE FOR NEW INDUSTRIAL BROCHURE NOW!

Guth LIGHTING

THE EDWIN F. GUTH CO.
2615 Washington Blvd.
St. Louis 3, Mo

A GUTH EXCLUSIVE!
KOLORKODED INDUSTRIAL FIXTURES

. . . red, green and yellow "signals" to direct traffic, protect workers, identify plant or storage areas.

This new cold drawn pickling house at the Huntington, West Virginia, works of International Nickel Company is an unusual and interesting application of corrosion-resistant material. The fact that all structural members, including even light fixtures, are outside the building shell, illustrates imagination in design.

Four rows of RESOLITE Fire-Snuf® Translucent Panels are installed in the roofing area to admit daylight. For night lighting the lights themselves are directed through the panels. Additional RESOLITE panels are used in the side and end walls. All material is treated with Super Hard Coat for long-lasting, maintenance-free life.

Here is another unusual application where RESOLITE engineers helped solve a corrosion problem. For additional information on RESOLITE Fiberglass Panels for industry write . . .

Engineering Specialists in Reinforced Polyester Panels

RESOLITE CORPORATION

P. O. BOX 539, ZELIENOPLE, PA.

DISTRIBUTORS IN PRINCIPAL CITIES

For more facts circle 611 on Reply Card

NEW PRODUCTS

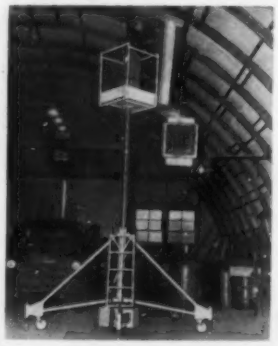
(Begins on page 216)

electromagnetic drive is designed to apply adjustable speed power to conveyors, fans and pumps, winders and metal slitting and forming machines. The drive can be set before or during operation to deliver any desired speed within its range. Speed can be adjusted quickly, and it remains adjusted, company states; a built-in tachometer monitors output speed and automatically corrects it, regardless of load changes.

A feature is the compactness of the control for this type of drive. Standard excitation and regulator control for air-cooled drives up to 30 hp measure only 9¾ by 8¼ by 24¼ in. Because of the small excitation requirements, Magnaflow Drives are adaptable to electronic or magnetic amplifier excitation control. Westinghouse Electric Corp.

24—WORK PLATFORM for inspection, maintenance jobs

For fast, safe access to overhead installation, inspection and maintenance work, the Spaceman Work Platform



has both indoor or outdoor application. It is available in several models with working heights of 21 ft to 40 ft. Features announced for this unit include: electric operation with standby hand pumps and complete mobility in the extended position. It folds into a compact unit for storage and passage through plant doorways. Ontario Equipment Co., Inc.

25—PAPER ROLL TOWEL is absorbent, economical

Because of its absorbency characteristics, a 9-by-9 in. section of Scott Merchant Roll Towel is considered equal in drying capacity to many paper towels dispensed in larger sizes. And although it will fit most paper roll towel cabinets, its use in company's Merchant-Matic Cabinet is more economical because this cabinet

Maintenance and Steam Traps

. . . there's a relationship that goes far beyond trap maintenance alone

Good traps and good trapping have a greater effect on your maintenance costs than does trap maintenance itself. By that we mean that the right traps, properly selected and installed, and with the benefits of a preventive maintenance program, will save far more maintenance dollars than they will cost.

Under the pressure of spiralling maintenance costs, this thought becomes mighty important. Let's take a look at what it involves:

Proper Selection of Steam Traps

1. Be sure it's the right type of trap.

2. Be sure it's sized right and is for the correct operating pressure.

3. Be sure it's first rate in design and construction.

Proper Installation of Steam Traps

1. Install them so they are accessible for inspection and maintenance.

2. Install a test valve.

3. Use a union or unions.

4. Use a shutoff valve or valves.

5. Use a strainer ahead of the trap if dirt conditions are bad.

6. Use a by-pass only where continuity of service is imperative.

7. Standardize inlet and outlet connections.

Preventive Maintenance Program

1. Test trap regularly for proper operation. (Trap size, operating pressure and importance determine frequency.)

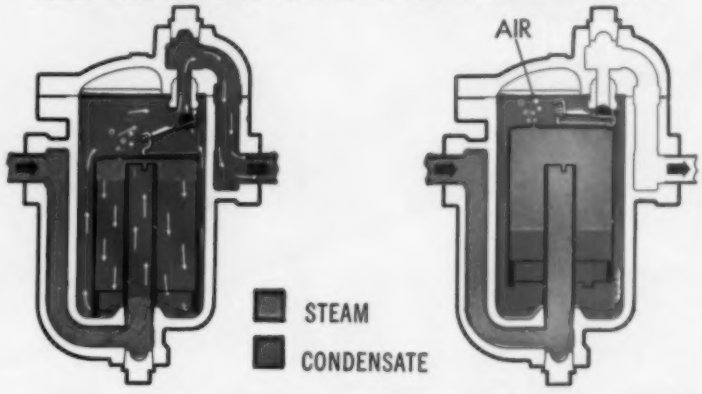
2. Inspect internal mechanism at least once a year.

You Get Indirect Benefits As Well

The direct benefits of the plan outlined are pretty obvious — good traps, properly selected, require less maintenance . . . testing and inspection prevents troubles that lead to maintenance.

However, this plan provides indirect benefits which reduce maintenance in other parts of the plant as well:

HERE'S THE STEAM TRAP DESIGN THAT CAN REDUCE YOUR MAINTENANCE PROBLEMS



Trap open. Condensate entering trap has caused bucket to lose buoyancy. Weight of bucket times leverage pulls valve open. Air is discharged along with condensate.

Trap closed. Steam has floated inverted bucket; valve is held tightly closed by system pressure. Air entering trap passes through bucket vent and accumulates at top of trap.

burning equipment and on ash handling equipment.

Good traps protect the system by eliminating water hammer and preventing the damage it can do.

Good traps discharge carbon dioxide before it can go into solution to form corrosive carbonic acid —less corrosion, less maintenance.

Good traps increase production to reduce the length of time equipment must operate or reduce the amount of equipment needed . . . either way maintenance is reduced.

How to Go About It (The Sales Pitch)

We admit we're prejudiced, but we don't think there is any better way to select steam traps than with the help of the 44 page Armstrong Steam Trap Book. Here in a single source is specific data on the selection and sizing of traps, how to install them for best results, and how to maintain them most economically.

The Steam Trap Book will also give you full information on the design and construction of Armstrong Inverted Bucket Steam Traps that offer these important maintenance-reducing advantages:

1. Armstrong Traps are dependable.

2. Armstrong Traps require no adjustments — go from full load to zero load automatically.

3. Armstrong Traps are self-scrubbing—ordinary dirt conditions can't hurt them.

4. Armstrong Traps have long-life parts — valve and seat are heat treated chrome steel — lever assembly and bucket are stainless steel.

5. Armstrong Traps have water sealed valves to minimize wire drawing and erosion.

Ask for your copy of the Steam Trap Book—there is no obligation. Then test Armstrong Trapping. If you are not completely satisfied with the results, you can return the traps for a full refund of the purchase price. You can't lose much that way. Call your local Armstrong Representative or Distributor, or write

Armstrong Machine Works
9128 Maple Street
Three Rivers, Michigan

ARMSTRONG STEAM TRAPS

"See our catalog in Sweets' Plant Engineering File"
For more facts circle 612 on Reply Card

Cost Conscious Companies Confirm that...

for Electrical Distribution or Test Needs

the Sensible Solution is

CUSTOM-DESIGNED *flexlab*®

EQUIPMENT by STANDARD

Realistic plant engineers recognize that, for design and construction of specialized equipment like this, it's good sense to rely on a qualified outside source.

By cooperating with a company like Standard, the harried plant engineer is freed of much troublesome detail... finds more time to turn his talents to his many other responsibilities.

Standard engineers will be glad to consult with you and offer recommendations. And whether the solution is a small power pack or a million dollar, multi-building installation, Standard has the skills, experience and facilities to design and produce—completely—the equipment to meet your requirements.

STANDARD TRADEMARK

Request Catalog No. 247 describing Standard industrial panels and consoles.

THE STANDARD ELECTRIC TIME CO.

89 LOGAN STREET • SPRINGFIELD, MASSACHUSETTS

For more facts circle 613 on Reply Card

NEW PRODUCTS

(Begins on page 216)

dispenses smaller sections. The new white paper towels are packed 16 rolls to a case—an estimated 8000 sheets per case. Scott Paper Co.

26—ELECTRIC BLOWER blows hot or cold air

Ace Model E-1 is a portable electric blower for blowing air at either room temperature or 170 F. It has application wherever rapid removal of moisture is desirable—as in drying out motors, electrical wiring and

switchboards, or in production or experimental drying of paints, varnishes, inks. While the velocity of the air stream is 11,500 fpm, the air blown is at low pressure, it is pointed out, and won't harm delicate equipment. This unit cannot be used as vacuum cleaner, but it can be used with air sweeping tools and sprayer attachments, manufacturer states. It features a 2/5-hp universal, 115-v a-c/d-c motor, polished aluminum housing. Ace-Sycamore, Inc.

27—REPAIR KIT for mending conveyor belting

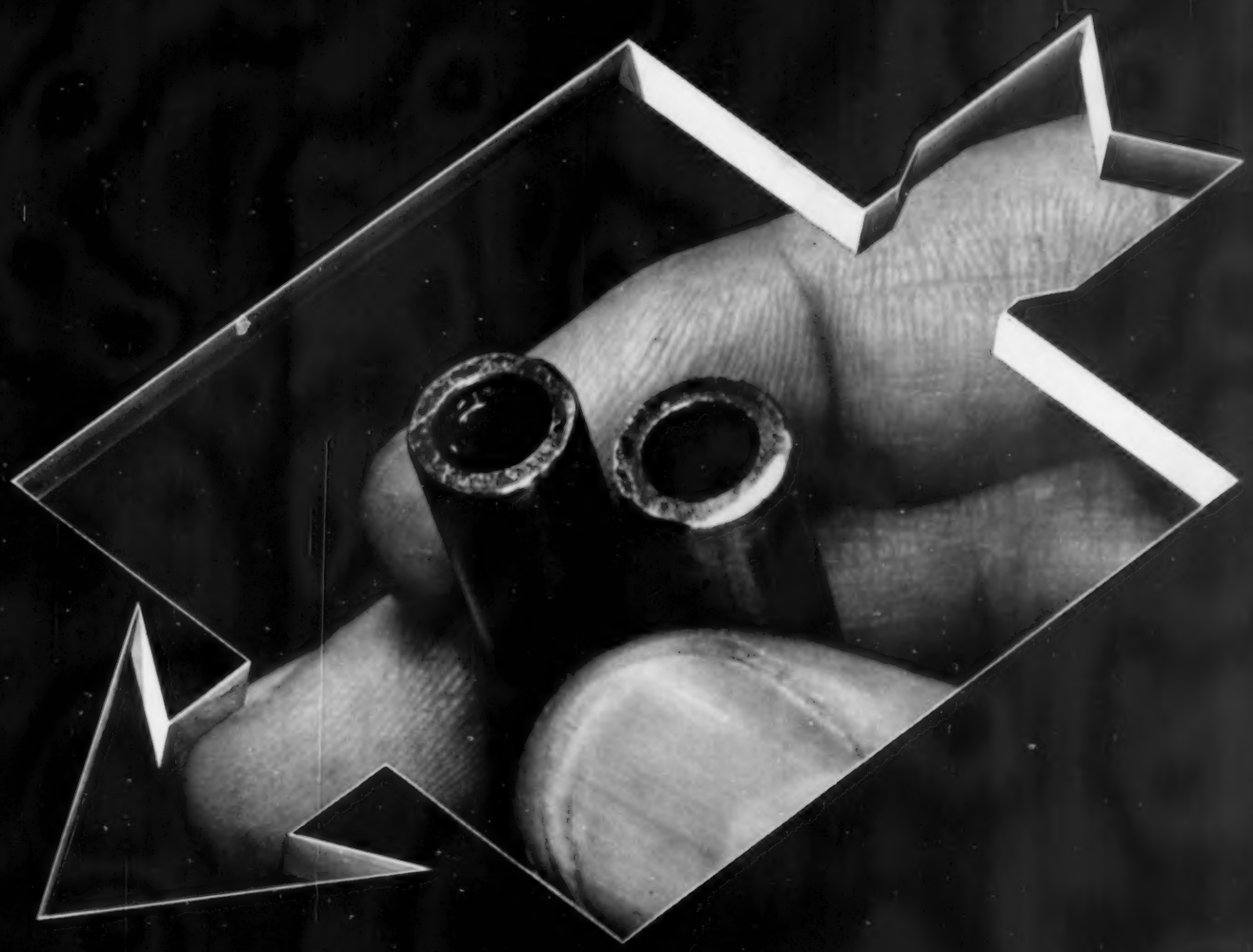
Holdtite Belt Repair Kit is designed for making permanent repairs to conveyor belting and other rubber products without special equipment, skilled personnel or heat sources usually required. It consists of various styles and sizes of repair components (rubber and fabric-reinforced patches, sheet material, putties and cements), simple tools required to do most repair jobs, and an instruction manual. Sealing and patching materials are self-vulcanizing compounds that cure quickly at room temperatures. United States Rubber Co.

28—FLOOR TOPPING gives rugged, non-slip surface

Duratrem is a heavy duty, light gray flooring, claimed to have exceptional resistance to solvents and chemicals, to withstand heavy trucking, and to

For more facts circle 614 on Reply Card →

Quality–the best economy of all



Two oils...two lines...one clogged...one cleaned

A Sunvis 700 oil and a regular oil were run through two equally clogged hydraulic lines. The regular oil couldn't remove the sludge. The Sunvis 700 oil cleaned its line thoroughly. That's one job it's made for . . . to clean out sludge deposits in hydraulic lines while it transmits power.

With a Sunvis 700 oil—like every Sunoco oil—you enjoy the best economy of all: the economy of quality. A Sunvis 700 oil lasts longer. The machinery it protects lasts longer. It prevents rust . . . ups output by reducing downtime.

FREE Trouble-Shooting Chart will help you spot and cure common hydraulic system troubles. For your copy, write to:

Sun Oil Company, Philadelphia 3, Pa., Department I-12.

MAKERS OF FAMOUS CUSTOM-BLENDED BLUE SUNOCO GASOLINES

SUNOCO

NEW PRODUCTS

(Begins on page 216)

have an attractive, non-slip finish. Duratrem is designed to cope with tough flooring problems of food processing, chemical and petroleum industries, and wherever manufacturing conditions present spillage of mild organic acids, alkalis, hot water, grease and oils. Manufacturer says it is easy to apply, can be feather edged, requires no compacting and normally needs no primer. Light traffic is permissible after 12 hr, heavy traffic after 24 hr. The Tremco Mfg. Co.

29—THREAD COMPOUND for high temp, pressures

Improved Fel-Pro C5-A is announced as an anti-seize thread compound for lubricating and sealing bolts, studs, flanges, etc., at high pressures and temperatures to 1800 F. Extra performance advantages claimed include increased lubricating and sealing qualities; lower breaking and running torque; non-settling, non-hardening, homogenized composition. Also, says manufacturer, this compound can be used in below freezing weather. C5-A's colloidal copper composition actually copper plates metal surfaces, it is stated, and the material can be used on all metals, their alloys and plastics. C5-A can also be used as a lubricant for lathe ways. Felt Products Mfg. Co.

30—WEDGE-WIRE SCREEN features increased capacity

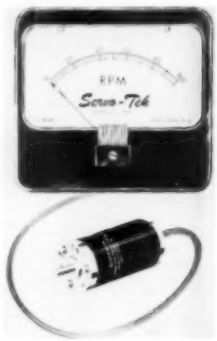
Rima is announced as a wedge-wire screen made of wire with thinner profiles than previously available—a feature permitting more wires per area

of working screen surface, increasing the percentage of open area and resulting in more tons passed per hour. It is suggested for screening, sifting, dewatering, sizing, washing and filtering minerals, chemical products, paper making materials and food products. Developed in Germany, and distributed in this country by National-Standard Co., Rima Screens are made of stainless and carbon steel. They are furnished in rectangular, oblique angled, round and oval beds with sharp or round bends, with slit widths down to 0.002 in. Special shapes are available. Screen wires come in several profiles, including slanting, tapered, flanged and diamond. The profiles are said to eliminate clogging because any particle that passes the top will quickly clear the entire opening. Cross Perforated Metals, National-Standard Co.

To receive product data circle item numbers on the handy Reader Service Card provided on pages 295-296.

31—SPEED INDICATOR has broad application

Described as a versatile "package" providing speed indication for almost anything that moves, the Servo-Tek Speed Indicating System combines company's panel-mounted meter to give full-scale speed indications from



100 to 12,000 rpm. Generator and indicator are connected by a low voltage cable that can be as low as 500 ft. Due to use of a permanent-magnet generator, there is no need for batteries, external power or periodic calibration, manufacturer points out. The system sells for under $90.00. Catalog 2659 gives details. Servo-Tek Products Co.

32—CUTTING TORCH has large flow capacity

Tuf-Tony features flow capacity enabling it to cut 24-in. steel. While primarily designed for heavy duty cutting under all conditions, this torch adapts to a variety of less demanding applications by use of different "Slip-in" tips. Another feature is an oxygen control valve to permit gradual introduction of cutting oxygen. This reduces slag spray and facilitates control in such processes as piercing, rivet washing, heavy cutting. The torch has an over-

WOULD YOU LIKE A POSTER OF THIS AD?

This is the third in a series of distinctive advertisements PLANT ENGINEERING is presenting to acquaint the general public with the important role the plant engineer plays in industry.

This advertisement, as well as the two previous ads in this series, has appeared in the *New Yorker* magazine.

These advertisements were designed by Noel Martin, one of America's leading designers, to help emphasize the statements industrial leaders have made regarding the important job the plant engineer is performing in their respective industries.

Through these three advertisements we have attempted to show the function, authority and responsibility of the plant engineer.

Order Your Copy Now

If you would like a 17 in. by 22 in. poster-size reproduction of this advertisement, as well as the two previous ones, just drop us a line. We'll be happy to forward them to you, free of charge, by return mail.

Indicate "Posters" on the post card in this issue or send your letter request to The Editor, PLANT ENGINEERING, 308 E. James St., Barrington, Ill.

PLANT ENGINEERING

magazine dedicates this series to its readers, the thousands of plant engineers who plan, purchase and maintain America's industrial plants and the equipment and supplies they use.

"What can a Plant Engineering Department contribute to a company? It can keep it from going broke*!"*

JOHN P. MOSER *Production Vice President, Lever Brothers Company*

SARCO TOPICS

How to save water and prevent over-cooling of compressors, small engines, and hydraulic oil-coolers

When cooling water is controlled manually the operator frequently leaves the valve nearly wide open, in order to play safe if the load varies. The result is over-cooling. If he attempts to vary the flow of water he risks the danger of under-cooling. Automatic cooling controls assure proper cooling at *all* times and effect important economies in water consumption.

And here are three different experiences at Revere Copper and Brass plants which may give you some tips on solving your own cooling control problems.

How Revere Copper & Brass Saved over 50% on water

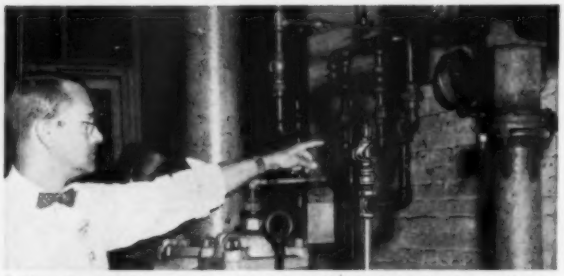
Sarco T-44 automatic cooling control installed at Revere's Riverside plant.

The Riverside, California, plant of Revere Copper & Brass was plagued by over-cooling of compressors. In addition, their water consumption was high — approximately 2,000 gallons an hour. By simply installing Sarco T-44 automatic cooling controls on the compressor cooling lines, plant engineers eliminated over-cooling and cut water consumption about 60%.

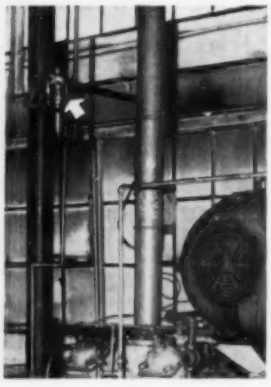
Another benefit was a saving in tool maintenance. (Originally excess moisture was causing difficulty with a large number of air screwdrivers used in the plant.) With the T-44's in service the maintenance problem has practically disappeared.

Manual control was wasting water at Rome Manufacturing Co. Div., Rome, N. Y.

At the Rome Manufacturing Company Division of Revere, at Rome, N. Y., cooling water for air compressors originally was manually controlled. When they installed Sarco T-44 automatic cooling controls on the cooling water lines they made substantial savings in water. They saved damage and maintenance cost on the compressors, too. That's because they eliminated the errors inherent in manual control. Automatic cooling controls always assure optimum cooling by permitting safe operation at the maximum temperature recommended for any given machine or process.



T-44 cooling control on compressor at Rome Manufacturing Co. Div. of Revere. Sarco sales representative Emile Strickland points to control installations.



Installation of a Sarco T-44 on compressor at Rome, N. Y.

Water conservation program at Baltimore led to automatic control

Double target of engineers at the Baltimore plant of Revere was a water conservation program plus tighter temperature control. To achieve both objectives they installed Sarco automatic cooling controls on an air compressor, an aftercooler and a hydraulic oil cooler.

Results were so satisfactory they followed through by installing 50 additional Sarco controls.

For more information on cooling control, contact your Sarco Sales Representative, District office, or write — 2169

SARCO

SARCO COMPANY, INC.
635 MADISON AVENUE, NEW YORK 22, N. Y.
PLANT: BETHLEHEM, PA.
STEAM TRAPS • TEMPERATURE CONTROLLERS
STRAINERS • HEATING SPECIALTIES

For more facts circle 615 on Reply Card

SARCO

Inside story on automatic cooling control

Simple, gadget-free design. Fully modulating. Sensitive liquid-filled thermostat gives you uniform movement of valve for each degree of temperature change, at all points on the range. Packless — no stuffing box — no leaks — no valve stem jamming. Self-contained — no part of mechanism exposed. Dependable and inexpensive — thousands in service. So reasonable in cost, you can afford Sarco automatic cooling controls for every application.

Sarco T-44 self-powered cooling control is available in standard 50° adjustment ranges: 60-110° F., 85-135° F., 110-160° F. and 135-185° F. Sizes: ⅜", ¾", ½" and 1".

For the full story on Sarco Cooling Controls...

contact your Sarco sales representative or district office, or write—

2168

SARCO

SARCO COMPANY, INC.
635 MADISON AVENUE, NEW YORK 22, N. Y.
PLANT: BETHLEHEM, PA.

NEW PRODUCTS

(Begins on page 216)

or-under cutting lever, reversible for operator preference. Tuf-Tony is described as rugged, yet light in weight (3 lb 10 oz) and well balanced, and having a slip-proof grip with adhesive handholds. It comes in 21- and 36-in. lengths, with heads of 75 and 90 deg. Smith Welding Equipment Corp.

33—PRECIPITATOR routs pollution from shop air

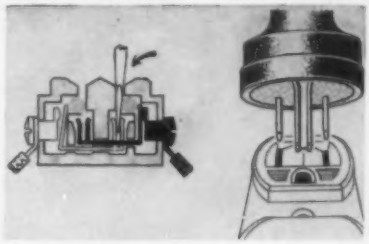
Misti-Maze Electronic Mist Precipitator is a compact, self-contained oil mist and fume precipitator for removal of oil mist, smoke and fumes for air exhausted from machine tools, welding booths and other industrial operations. The unit contains a blower,

a filter and an electrostatic precipitator. Collected coolant from machine tool operations can be returned to the machines for re-use. Air exhausted from the unit is recirculated to the shop. The unit requires only a simple ductwork to the machine tool or welding booth to collect the polluted air, an electric connection, and drain.

Exhausted air from the shop operation is directed through a pre-filter where larger droplets are impinged on finely meshed wire media. The droplets drain to a reservoir in the base of the Mist-Maze. Finer particles of oil mist or fumes then pass through an electrostatic precipitator consisting of two adjacent ionizing cells and collector plates. The unit comes in two sizes: one is rated at 600 cfm capacity, the other at 1200 cfm. Air-Maze Corp.

34—RECEPTACLE designed to prevent electrical accidents

SG-62 Twinsafe is a duplex safety grounding receptacle designed to protect against electrical shock. It does this in two ways. First, it shunts current harmlessly away from metallic objects which may have been carelessly inserted in the slots. Second, it has a U-shaped slot for grounding power tools and appliances equipped with plugs having U-shaped grounding blade. It is pointed out that electrical codes require that such devices be grounded to minimize shock



caused by short circuit—yet most convenience outlets provide no means of grounding. This safety grounding receptacle provides an easy means of grounding appliances. Use of the SG-62 Twinsafe is not limited to public buildings—in baseboard or wall outlets of homes it serves to protect small children who may be tempted to push objects into the outlets.

In drawing at left, the black indicates parts carrying current. The screwdriver (arrow) inserted in right-hand slot energizes opposite slot and doesn't touch any part carrying current. Drawing at right shows slot for grounding. Harvey Hubbell, Inc.

35—FILTER removes liquid from compressed air

Due to improved baffling, Series 30 BE Filters are designed to remove all liquid present in compressed air over the full range of air-flow capacity of the air line. The rugged, transparent plastic bowl is claimed to offer a higher safety factor and greater resistance to fatigue under cycling loads. According to company, this bowl is also larger than before, and has a larger quiet zone, holding 53 per cent

more liquid before emptying becomes necessary. Quick and easy cleaning is stressed. To take the filter apart, a spring clip on the clamp ring is opened by hand, the ring removed, and the bowl pulled off. Then the baffle, holding the filter element, is screwed off

Industry's most complete line of HEAVY DUTY FLOOR MACHINES

TENNANT Model K

As America's most widely used machines for cleaning industrial floors, TENNANT Machines are standard equipment today —in 96 out of 100 major plants.

You will find them in a class by themselves for *removing hard grease-caked dirt from your floors in one operation.* Here are typical cost-saving models:

FOR CONGESTED AREAS—Rugged, versatile walk-behind Floor Machine (Model K). Instantly pulverizes and picks up soilage from 16″ path. Powerful 1750 rpm wire brush shears off incrusted grime deposits and hurls it into the hopper. Leaves a clean, dry surface. Works close to machines, walls, etc. Gasoline or electric models; accessories for sanding, steel wool buffing, etc.

TENNANT Model L

FOR AISLE CLEANING—Operator rides the TENNANT "L" as it cleans 21″ path at speeds up to 3 mph. Cylindrical tool revolves at 1600 rpm. Shaves off heavy build-up of grease, dirt, wax, rubber deposits, metal chips and dried paint, at *a single pass.*

Cleans up to 4000 sq. ft. per hour . . . a rate 6 men couldn't equal by hand.

Picks up as it cleans. Powerful vacuum system controls dust. Leaves smooth, level surface for efficient trucking.

Has sensitive hydraulic controls; tool pressure is easily adjusted to obtain desired cleaning action. Has ample power to remove thick, heavy grime.

TENNANT Model R

FOR HIGH SPEED CLEANING—Powerful 25 hp TENNANT "R" cleans and picks up grime from 36″ path; moves with traffic at speeds up to 6½ mph. Shaves off grease and dirt to leave floor clean, dry, smooth, with excellent traction.

Cleans as fast as a 6 to 18 man scraping crew . . . and does a far better job. Vacuum system controls dust. Ten cubic foot hopper holds approximately 700 lbs. pulverized grime; lifts and dumps hydraulically in seconds.

WRITE TODAY *for illustrated bulletins . . . photos and data on how to reduce floor cleaning costs. G. H. Tennant Co., 771E N. Lilac Drive, Minneapolis 22, Minn.*

Industry's Most Widely Used
FLOOR MACHINES

OUR 90th YEAR
TENNANT

SPECIALIZED MAINTENANCE EQUIPMENT

POWER SWEEPERS • FLOOR MACHINES • SCARIFIERS • ROOF SCRAPERS • CONCRETE ROUTERS

For more facts circle 616 on Reply Card

NEW PRODUCTS

(Begins on page 216)

by hand and the filter element removed for cleaning.

Metal bowl filters—Series 30 BE-N —are available for applications subjected to higher pressures, temperatures and rougher usage. Both types are available for use with ¼-, ⅜- and ½-in. pipe sizes. There are four optional and interchangeable filter elements for removing solid particles—grit, dust, pipe scale, rust etc.—from compressed air. These are cleanable and re-usable. A 74-micron, 200-mesh, reinforced Monel wire screen is standard, but for removing smaller particles optional 64-, 25- or 5-micron sintered metal filter elements are available. C. A. Norgren Co.

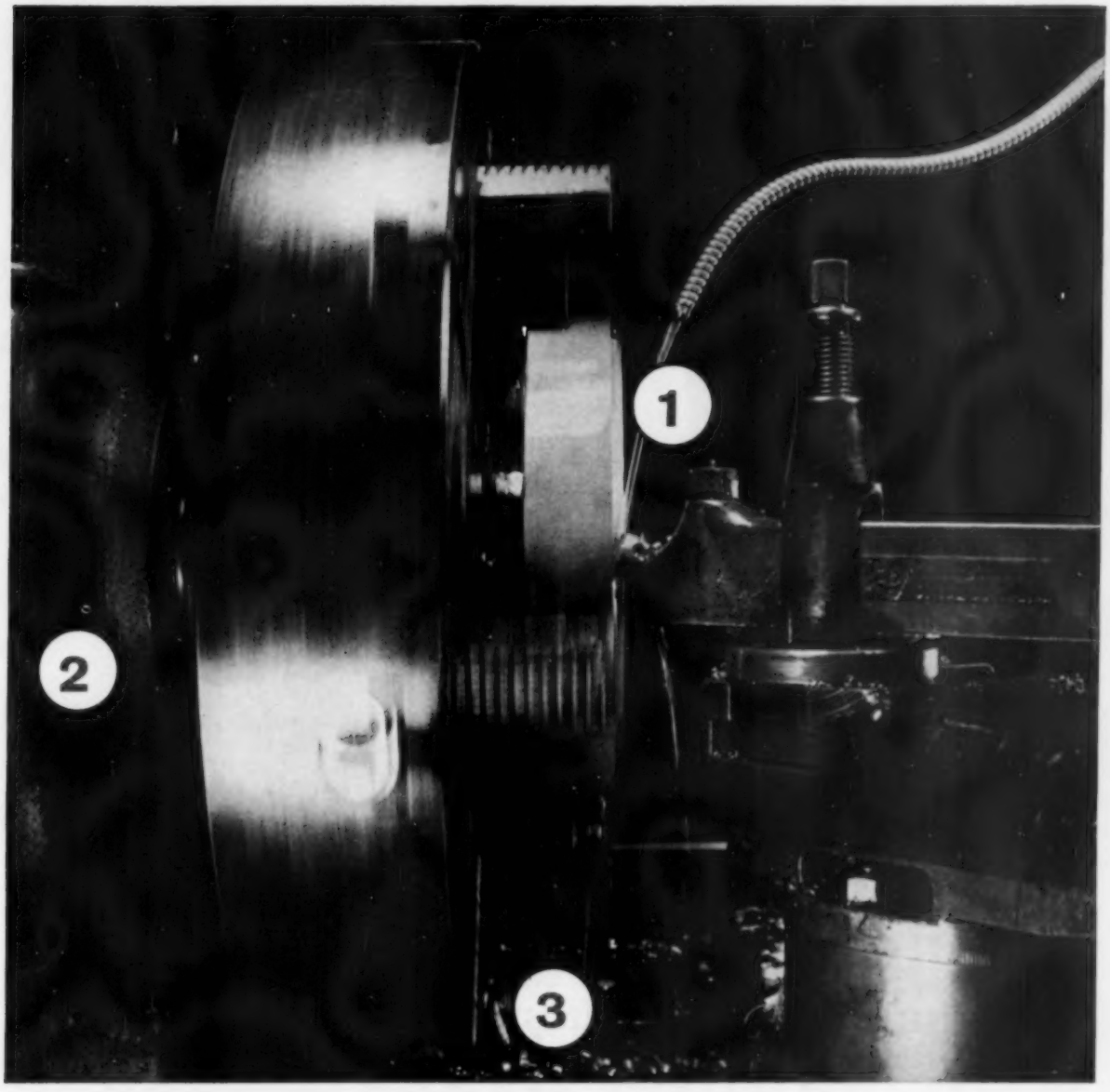
36—LINE TESTER for sprinkler systems

The Seco Line Tester is designed for easy, fast testing of fire protection sprinkler systems. A permanent installation in new or existing systems,

the line tester is ready to determine the condition of branch lines simply by removing the side outlet cap, connecting a hose and turning the hex head to open position. Advantages of this tester include installation without shutting down system or production, and a regular testing schedule to assure proper functioning of system in event of fire. Approval by Factory Mutal Laboratories is announced by manufacturer. Seco Mfg., Inc.

37—VACUUM BREAKER for high purity piping

For prevention of backflow in water supply or other high-purity piping systems, this vacuum breaker is injection molded of unplasticized polyvinyl chloride and will be manufactured initially in ⅜-, ½-, and ¾-in. nominal pipe sizes. It makes available the corrosion-resistant non-contaminating properties of UPVC for



CUT THROUGH PRODUCTION LAGS WITH ESSO LUBES

1. Fanox® high-wetting, non-staining oils for use in cutting non-ferrous metals and for quenching and drawing all metals. The low viscosity of Fanox 32 helps boost the heat dissipation rate to speed the work . . . as in the aluminum machining above.

2. Nuto® oils protect highly finished gear surfaces from excessive wear and rust. Resist foaming to assure ample lubrication. Oxidation inhibited to prevent sludging . . . provides month-after-month service.

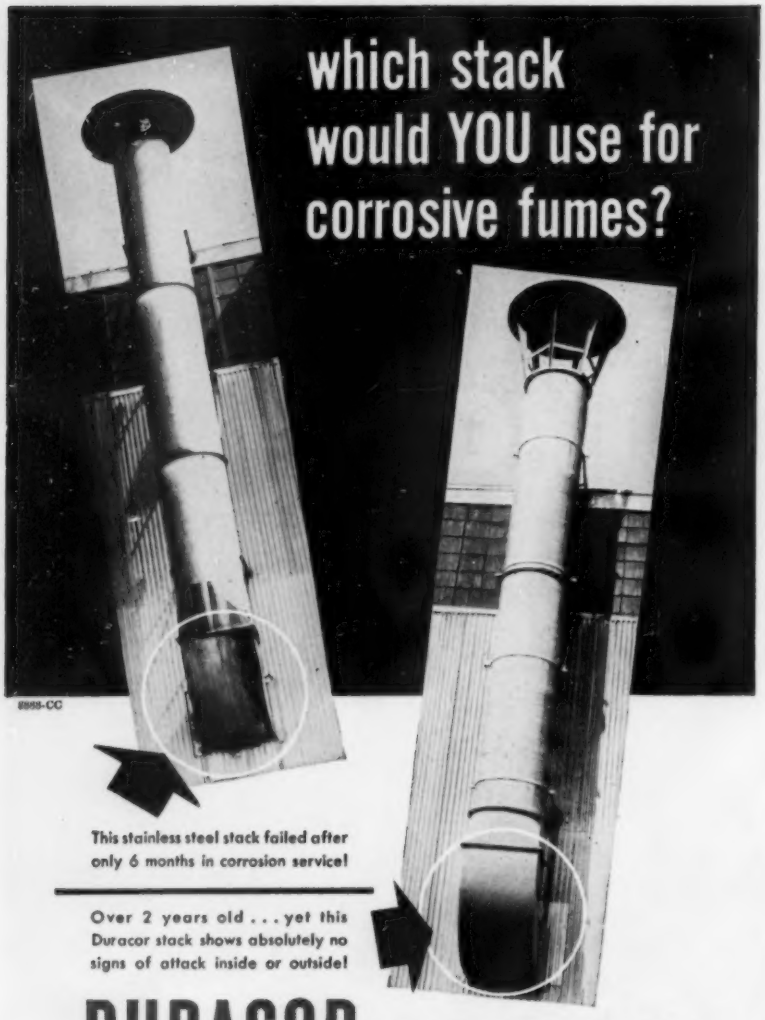
3. Febis® K lubricants insure smooth-sliding ways . . . boost precision by eliminating "stick-slip" movement. These lubes actually make static friction less than sliding friction; easily pass the stick-slip test.

There's a complete line of specialized Esso Lubricants to help you cut through production lags. Contact your local Esso office or write: Esso Standard, Division of Humble Oil & Refining Company, 15 West 51st Street, New York 19, N. Y.

ESSO

In Industry after Industry..."ESSO RESEARCH works wonders with oil"

For more facts circle 617 on Reply Card


which stack
would YOU use for
corrosive fumes?
8995-CC
This stainless steel stack failed after only 6 months in corrosion service!
Over 2 years old . . . yet this Duracor stack shows absolutely no signs of attack inside or outside!

DURACOR VENTILATING SYSTEMS PROVIDE LASTING CORROSION RESISTANCE AT LOW COST!

Performance-proven Duracor Ventilating Systems and components provide outstanding resistance to attack from all types of corrosive fumes. These high-strength systems are corrosion-proof throughout . . . are practically immune to weathering . . . require only minimum support! Best of all, Duracor construction can save you up to 30% on your initial investment . . . and it's maintenance-free! Ceilcote engineers will design a complete Duracor system to meet your special requirements . . . or modify your present system to permit gradual conversion to Duracor. Fabricated to meet customer specifications . . . or assembled from stocked component parts . . . Duracor Ventilating Systems can be easily installed by regular plant maintenance crews or by experienced Ceilcote installation personnel. Write today for the new Ceilcote catalog.

DURACOR CEILCOTE

ANOTHER PRODUCT OF

THE CEILCOTE COMPANY, INCORPORATED

4915 Ridge Road • Cleveland 9, Ohio

For more facts circle 618 on Reply Card

NEW PRODUCTS

(Begins on page 216)

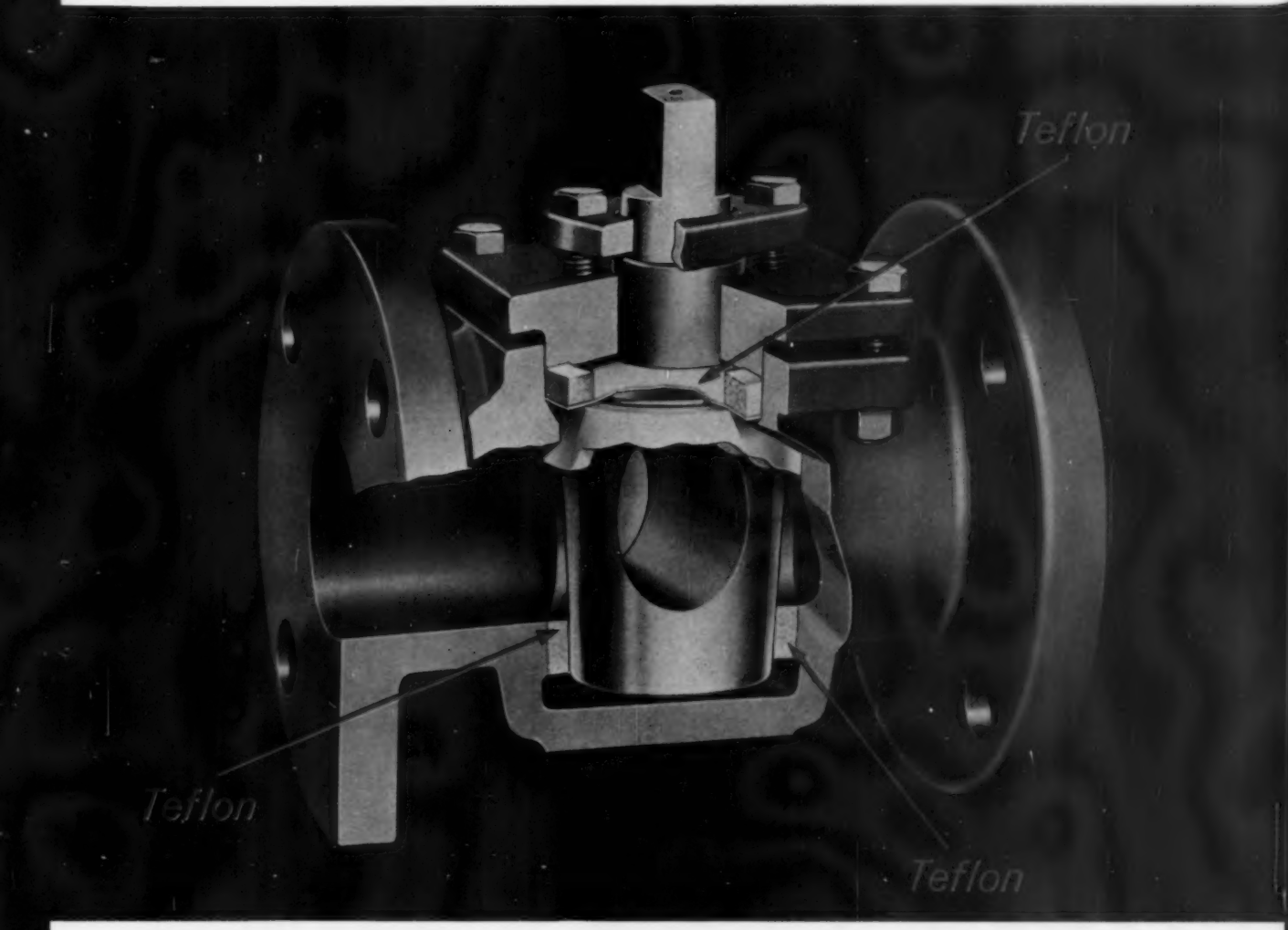
backflow prevention applications in pharmaceutical process lines, laboratory piping, sanitary plumbing etc. The breaker incorporates an all-plastic movable disc, wholly within the unit which is designed to move up to close air vents and permit free flow of water or other liquid through the device, then seats itself in a vacuum-tight seal to prevent back siphonage when the flow stops. A removable cap protects air vents against exterior fouling. Manufacturer says the unit is designed to meet state and municipal plumbing code requirements, and meets requirements of the National Sanitation Foundation for potable water supply piping. Tube Turns Plastics, Inc.

38—WOODEN LADDER has self-leveling feature

Outstanding feature of the Surefoot is an automatic self-leveling device consisting of a coil spring within a rugged aluminum tube. The spring serves to automatically adjust the ladder's legs to uneven terrain, making wedges, blocks and shims unnecessary. Once the ladder is set and the legs have compensated for the un-

even ground, the bottom rung automatically sets a pin-lock when the first step is taken, it is explained, and the ladder remains set until the pin's ring is pulled. Three optional foot pads are offered for the leveling device: a hard, rough rubber for normal use, a single large spike or multiple cleats for use on snow or ice.

Another safety and performance feature is a sling attachment fitted over the top of each rail. It functions to hold the top of the ladder snugly against poles, building corners, pipes and other vertical projections. High dielectric properties of the rubber sling permit use around electrical installations, says company, and the



THROW OUT LUBRICATED PLUG-VALVE PROBLEMS

Install non-lubricated DURCO Type G Sleeveline valves

Wherever you have cast iron or semi-steel valves that stick, gall, break, leak thru, or otherwise cause maintenance nightmares, install ductile iron Durco Type G valves with Teflon sleeves.

Durco Sleeveline valves are available in ductile iron or stainless steel, screwed or flanged ends, from ½″ through 6″, with 150 psi rating.

Write today for your copy of Bulletin V/12.

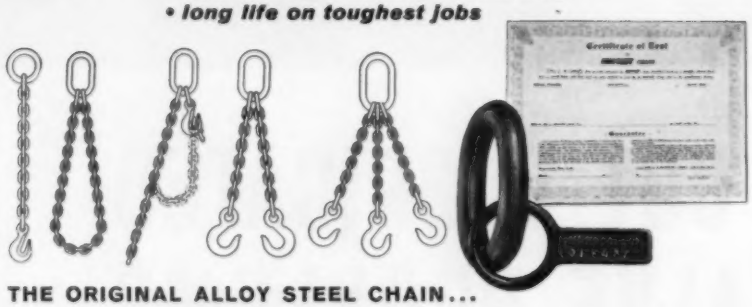
DURCO
CORROSION RESISTING ALLOYS & EQUIPMENT

THE DURIRON COMPANY, INC., Dayton, Ohio / Valves • Pumps • Filters • Process Equipment

For more facts circle 619 on Reply Card

for the man who wants everything in chain

- *high resistance to impact loading*
- *maximum safety for overhead lifting*
- *lighter weight for easier handling*
- *long life on toughest jobs*



THE ORIGINAL ALLOY STEEL CHAIN...

FIRST TO BE TESTED, REGISTERED AND GUARANTEED

A Certificate of test including guarantee is issued for each new Herc-Alloy Sling Chain shipped from our factory. A metal registration tag is permanently attached bearing the serial number which is recorded in our engineering files with full details about your chain.

FIRST CHOICE WITH EXPERIENCED CHAIN BUYERS SINCE 1933

Herc-Alloy is made from a special analysis alloy steel and is heat treated by an exclusive process. Links are electrically welded by the time-tested Inswell electronically controlled method. All attachments are alloy steel including those to your specifications which are forged in our own shop. Everything about Herc-Alloy spells B-E-S-T. Best for you. Best specify Herc-Alloy.

DO YOU HAVE A CHAIN SAFETY PROGRAM?

It's especially vital if you do overhead lifting...your safety program should include chain care, use and inspection. Literature and assistance available. Write for Data Book.

CM CHAIN

COLUMBUS McKINNON CHAIN CORPORATION, Tonawanda, N. Y.

New York • Chicago • Cleveland • Los Angeles • San Francisco

In Canada: McKinnon Columbus Chain Ltd. St. Catharines, Ont.

For more facts circle 620 on Reply Card

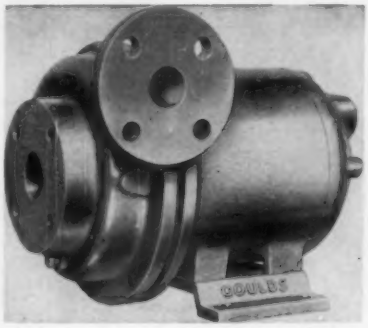
NEW PRODUCTS

(Begins on page 216)

fabric reinforcement within it increases strength and service life. Bulletin 460-25C gives further details. Industrial Ladder Co.

39—CENTRIFUGAL PUMP for the hazardous liquids

This seal-less (canned) centrifugal pump, Intacta, is introduced for handling of hazardous liquids (volatile, toxic or inflammable). It has no mechanical seal, stuffing box or gland. These features are the result of com-

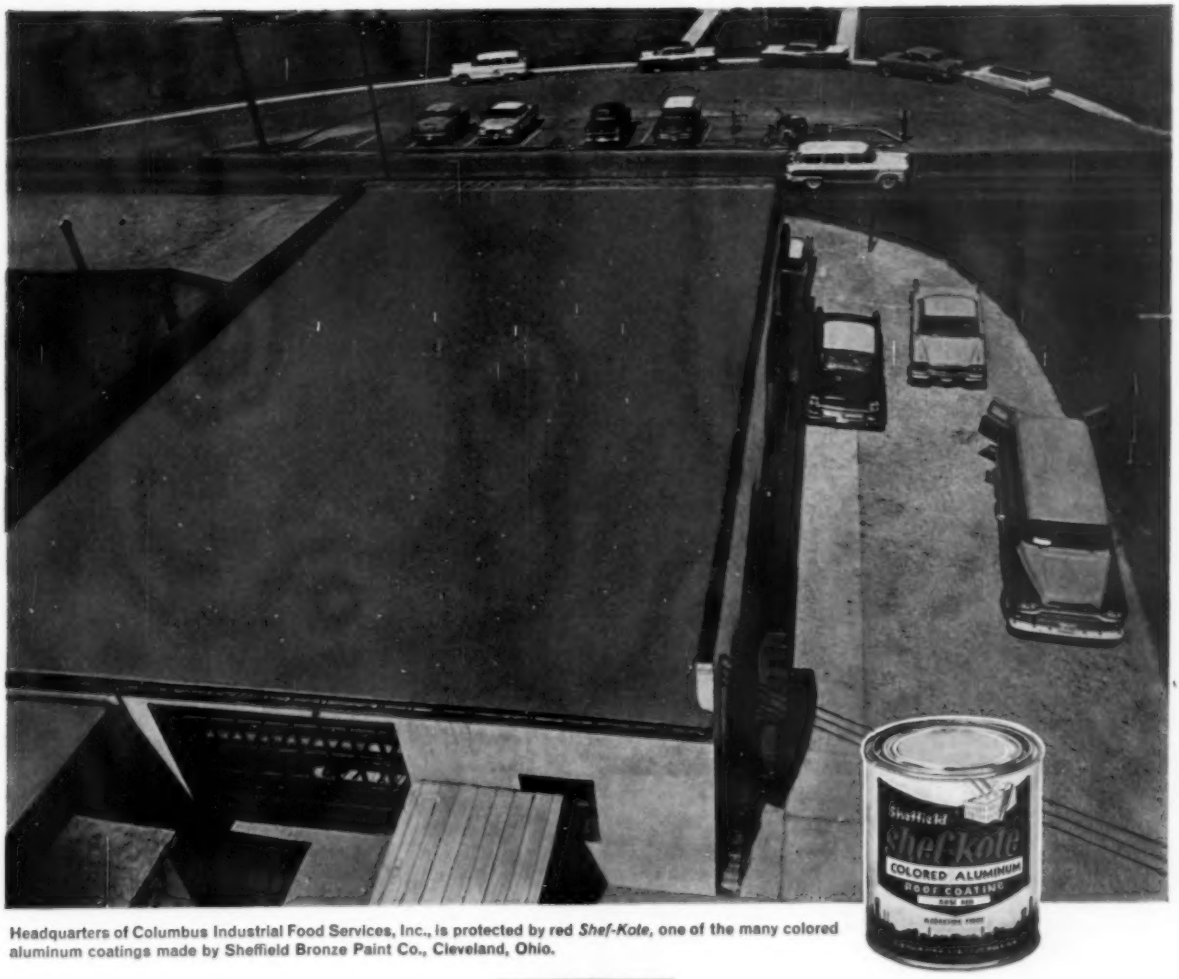


bining the motor and pump in an integral unit. Built in two sizes with 1- and 1¼-in. discharge, pumps have a capacity range to 110 gpm., heads to 100 ft, and are designed for handling clear liquids only. Motor cooling and parts lubricating is accomplished by circulating a controlled portion of the liquid being handled through the hermetically sealed rotor housing and the grooved bearings. Pumps are equipped with a built-in thermal cut-out device that protects the motor if the motor winding temperature exceeds the maximum limit. They are supplied in 316 (CF8M) stainless steel but other materials can be had. Data available in Bulletin 728.1. Goulds Pumps, Inc.

40—COLOR-COATED STEEL serves modern design trends

For use on walls and roofs, or as an accent material with brick, wood, stone or glass, color-coated steel is being offered in nine new colors. As announced by manufacturer, these colors will be available on 26-, 24- and 22-gage panels, 36-in. covering width, in lengths as desired. The factory-applied, baked-on color won't chip, peel or fade, it is stated, and is virtually a part of the steel—a vinyl-aluminum or vinyl-base color coating applied in multiple layers over a galvanized zinc coating and a clear adhesive bond coating. Seven of the nine colors are basic: white, light blue,

For more facts circle 619 on Reply Card



Headquarters of Columbus Industrial Food Services, Inc., is protected by red *Shef-Kote*, one of the many colored aluminum coatings made by Sheffield Bronze Paint Co., Cleveland, Ohio.

a visit with Frank Andrews, president of Columbus Industrial Food Services, Inc.

SUBJECT: SHEFFIELD'S COLORED ALUMINUM ROOF COATING

It was nice to chat the other day with Frank Andrews, prominent Columbus, Ohio, industrial caterer. Of course, we worked the conversation around to the new appearance of his roof. Early last year, he said, the 10-year-old surface was restored with Sheffield's *Shef-Kote* Colored Aluminum Roof Coating, made with Alcoa® Pigments. What about results? we asked.

"Initial cost was somewhat more, but I felt that a quality product such as this would save money in the long run and would give our employees greater comfort," replied Mr. Andrews. "*Shef-Kote* has helped lower interior temperatures . . . in fact, I've hardly noticed heat in the building all summer."

Of course, it was too soon for Mr. Andrews to talk about lower maintenance costs or years of weatherproof protection. But we did point out that a tough, fibrated coating like *Shef-Kote* forms a tight continuous surface that seals out air and moisture; that it expands and contracts with temperature changes without cracking; that the reflective aluminum flakes protect from the intense radiation of the sun.

Mr. Andrews said to come back in a few years to test these statements. We intend to.

Alcoa does not make roof coatings, but we will gladly refer you to reputable manufacturers who do. Send today for our booklets, *Painting With Aluminum* and *Aluminum Roof Coatings Make Time Stand Still.* Send the coupon.

Look for this label . . .
It's your guide to
the best in aluminum value

For exciting drama watch "Alcoa Presents" every Tuesday, ABC-TV, and the Emmy Award winning "Alcoa Theatre" alternate Mondays, NBC-TV

Aluminum Company of America
1740-E Alcoa Building, Pittsburgh 19, Pa.

Please send your free booklets:

☐ *Painting With Aluminum*
☐ *Aluminum Roof Coatings Make Time Stand Still*

Name_____

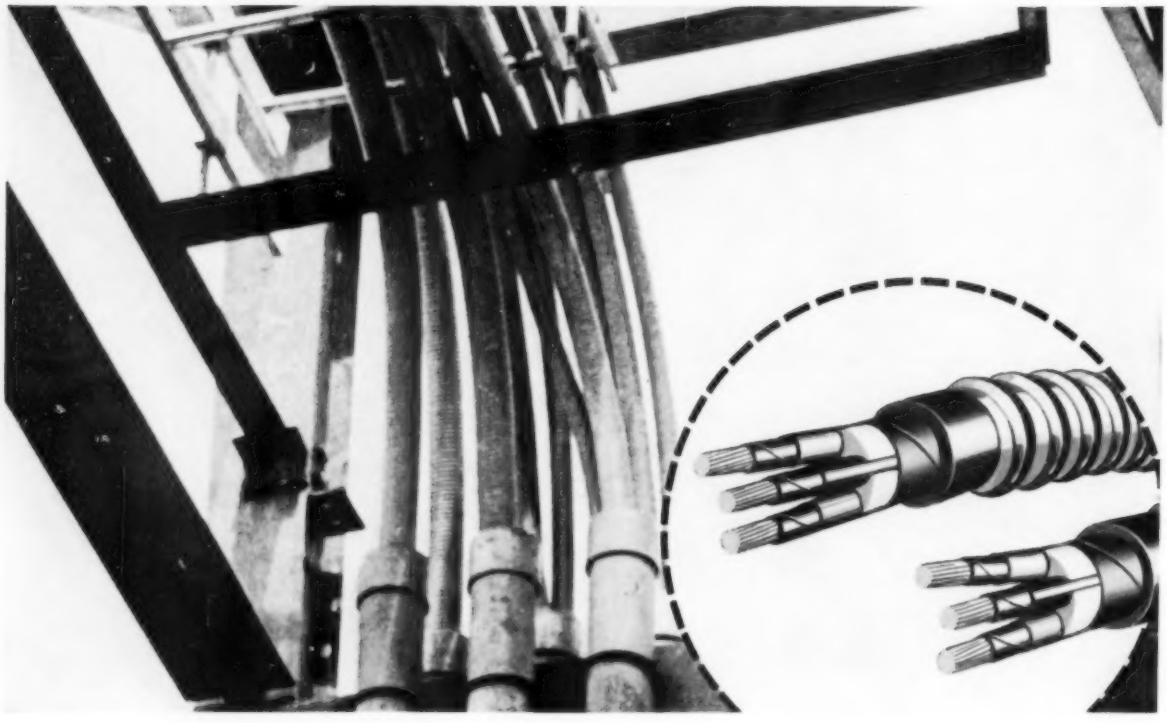
Company_____

Address_____

City_____ Zone____ State_____

For more facts circle 621 on Reply Card

Goodyear uses
NATIONAL ELECTRIC NEPCO-LOK in plants around the world



Thousands upon thousands of feet of Nepco-Lok Interlocked Armored Cable are installed in Goodyear plants from the Philippines to Scotland. Typical installation is found in the Goodyear Venezuela plant where more than 20,000 feet of various sizes has been installed for the primary and secondary power distribution systems.

Nepco-Lok Interlocked Armored Cable is the ideal material to use where there is danger of mechanical damage. It is easy to install and gives complete flexibility. If a line has to be replaced, Nepco-Lok is 100 percent salvageable.

For information, write: *National Electric Division, H. K. Porter Company, Inc., Porter Bldg., Pittsburgh 19, Pennsylvania.*

NATIONAL ELECTRIC DIVISION PORTER **H. K. PORTER COMPANY, INC.**

PORTER SERVES INDUSTRY with steel, rubber and friction products, asbestos textiles, high voltage electrical equipment, electrical wire and cable, wiring systems, motors, fans, blowers, specialty alloys, paints, refractories, tools, forgings and pipe fittings, roll formings and stampings, wire rope and strand.

For more facts circle 622 on Reply Card

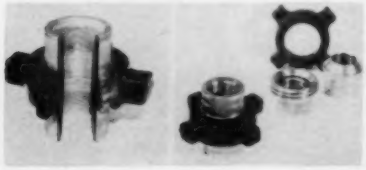
NEW PRODUCTS

(Begins on page 216)

deep blue, light green, mist green, light gray and slate gray. Two "accent colors," orange and yellow, can be used is highlighting specific areas. Stran Steel Corp.

41—HIGH PRESSURE UNIONS are easily installed

These 4000- and 6000-lb working pressure unions have a fast "make-and-break" feature designed to speed and simplify installation and maintenance of pipeline systems. The unions



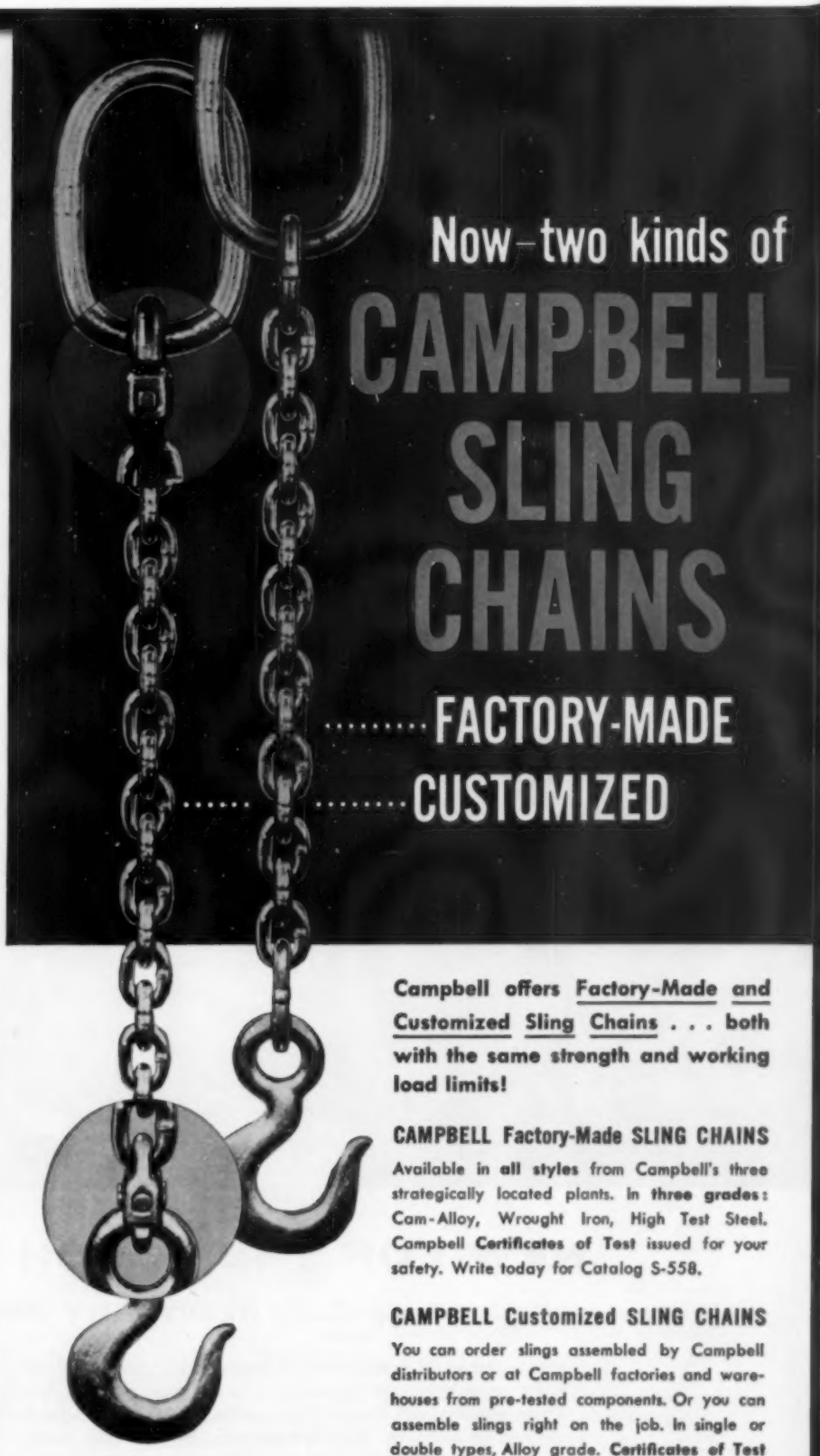
have a three-pitch acme thread which turns easily, resists clogging by foreign matter and may be cleaned quickly, according to manufacturer; and in addition to providing easier make-and-break, this thread withstands more physical abuse than a conventional V-thread. The 6000-lb unions have a combination seat, both rubber-to-metal and metal-to-metal. The rubber seal is replaceable. The 4000-lb unions have a metal-to-metal seat only. Both units are for 2-in. diam pipe. Clayton Mark & Co.

More information on any of these products can be yours without cost or obligation. Just circle the item numbers on the Reader Service Cards provided on pages 295-296.

42—LIQUID FILTER is small, low in cost

For processes involving small flows, the LFH Filter has application in process water, industrial water, brine solutions, demineralized water, process fluids. Filter elements are available in Poro-Stone, Poro-Carbon, Micro-Maze (sintered metal) or Poro-Edge—depending on degree of filtration desired. If required, diatomaceous earth of similar filter aid can be used to provide microscopic-size passages for filtering out the smallest particles, including many bacteria and algae. Cleaning by backwashing is facilitated by the "pressure dome" design. Just close the outlet valve on empty filter, build up

For more facts circle 623 on Reply Card →



Campbell offers Factory-Made and Customized Sling Chains . . . both with the same strength and working load limits!

CAMPBELL Factory-Made SLING CHAINS

Available in all styles from Campbell's three strategically located plants. In three grades: Cam-Alloy, Wrought Iron, High Test Steel. Campbell Certificates of Test issued for your safety. Write today for Catalog S-558.

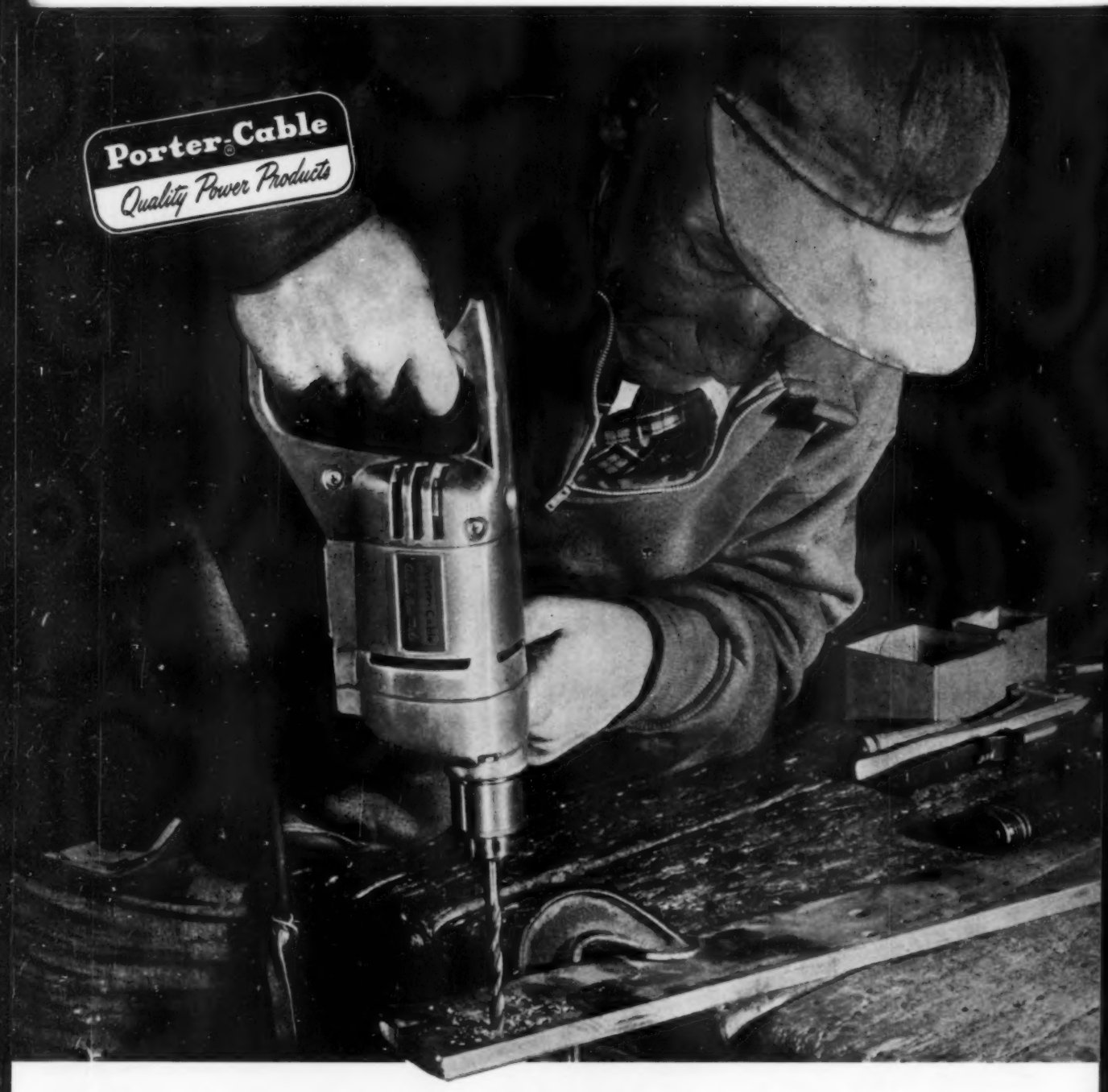
CAMPBELL Customized SLING CHAINS

You can order slings assembled by Campbell distributors or at Campbell factories and warehouses from pre-tested components. Or you can assemble slings right on the job. In single or double types, Alloy grade. Certificates of Test issued for complete assemblies or components. Write today for Catalog CSA-1.

CAMPBELL CHAIN

CAMPBELL CHAIN *Company*

FACTORIES: York, Pa.; West Burlington, Iowa; Union City, Calif.
WAREHOUSES: E. Cambridge, Mass.; Seattle, Wash.; Portland, Ore.; Atlanta, Ga.; Dallas, Texas; Chicago, Ill.; Los Angeles, Calif.



NEW FOR THE TOUGH JOBS...

Porter-Cable HEAVY-DUTY DRILLS

Added to the world-famous line of "professional" power tools are 10 *new* drills... a superior drill for every industrial operation, with the most popular chuck capacities and speeds.

These quality-built Porter-Cable drills deliver top *continuous* performance on a wide variety of drilling jobs. They last longer... because each motor specifically built for each drill eliminates vibration, delivers optimum power and speed... because finest precision ball bearings are used throughout... because the gears are cut with extra wide teeth for greater strength.

See them at your Porter-Cable distributor... or write for illustrated catalog with complete specifications.

PORTER-CABLE MACHINE COMPANY

6445 Marcellus Street, Syracuse 4, N. Y.

For more facts circle 624 on Reply Card

THE RIGHT DRILL FOR EVERY JOB...

New "D" Handle Drills—For in-line drilling on a wide variety of operations, there's a heavy-duty Porter-Cable Drill—from ¼" to ⅜". Full 3.6 amp power is delivered to rugged ½" dia. chuck spindle. Auxiliary side handle provides extra leverage.

New Heavy-Duty Pistol-Grip Drills—8 heavy-duty drills offering a variety of speeds and capacities for every job—from ¼" to ⅜" Full ball-bearing construction, steel alloy compound reduction gears... gasket-sealed, leak-proof gear housing.

New Keyless Chuck Ball-Bearing Drill—Model 355 is a heavy-duty ¼" all ball-bearing drill with precision keyless chuck for fast bit changes. Sealed chrome ball bearings permit instant hand locking and self-tightening of finest alloy steel chuck jaws. Gears enclosed in leak-proof, gasket-sealed housing.

See this complete line of Professional Drills at your Porter-Cable dealer or write for free illustrated folder.

Porter-Cable
Machine Company,
6445 Marcellus St.,
Syracuse 4, N.Y.

Porter-Cable
Quality Power Products

NEW PRODUCTS

(Begins on page 216)

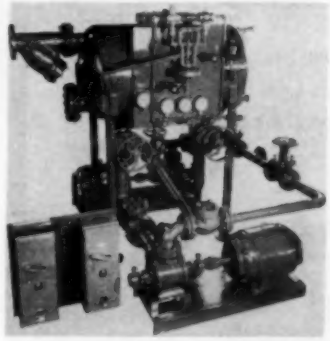
pressure with the supply pump (trapping air in the dome), then release backwash valve for "explosive" cleaning. This is said to produce powerful cleaning action.

On-stream flow rates of LFH Filters are rated at 1 to 2 gpm per square foot of filter area; however, where liquid to be filtered and nature of solids to be removed are suitable, flow rates to 4 gpm are reported possible. Units come in four sizes offering 14 to 40 sq ft of filter area. Engineering Bulletin 410 gives full data. R. P. Adams Co., Inc.

43—BOILER RETURN SYSTEM saves fuel and steam

The Duplex Boiler Return System is said to save both fuel and steam while permitting high pressure boilers and steam processing units to operate at top efficiency. It is designed to automatically maintain a positive differential between steam supply and return lines. As a result, condensate and air are quickly evacuated from the steam line, it is explained, permitting processing units to operate continually at full capacity. Steam requirements are reduced because condensate is returned to boiler usually within 10 deg of the temperature of saturated steam.

This is a closed system, consisting of receiver tank for condensate, two 2-



stage pumps, differential valve, piping and remote electrical control panel, shown at lower left in photo. Both pumps operate when processing units are started. At a predetermined pressure, one automatically cuts off and the other maintains the discharge pressure necessary to return condensate directly to boilers. The differential valve serves to automatically admit correct amount of steam to receiver. The system comes in 10 sizes, with boiler capacity range from 100 to 2000 hp. Stickle Steam Specialties Co.

44—ALL-CLIMATE SHELTER is assemble-it-yourself unit

Although developed for the armed forces as an all-climate communications center, this 50-ft fiber glass shelter is suggested as a temporary or semi-permanent manufacturing, office, maintenance shop or warehouse facility. Manufacturer says the interchangeable cam-locking sections can be erected in an hour by four men using a single tool, and can be dismantled in 10 min. Sections for an entire 50-ft structure are said to be so light that a whole building can be transported by air. The building is

described as weathertight, lightproof, insulated for heat and humidity, resistant to fungus and termites and more impervious to onslaughts of nature than the "whale half out of water" it resembles. Portable heating and air conditioning units can be used to maintain a temperature of 70 F.

The structures come in lengths from 20 ft. Free of internal supports, the buildings are 10 ft high at the peak. They do not require surface finish maintenance as color pigment is in the fiber glass. Specialty Electronics Development Corp.

45—STATIC CONTROL for synchronous motor starting

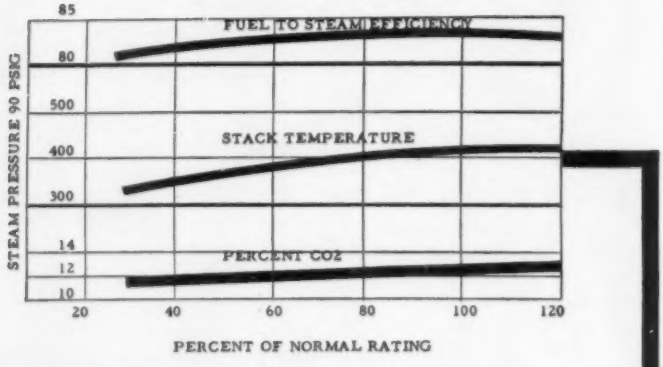
Static Slipsyn is introduced for application on all low- and high-voltage synchronous motor starting equipment. The circuitry employs all static components and is designed to perform complex logic operations, including: application of motor-field excitation at both the proper speed and most favorable rotor and stator relationship; detection and removal of excitation if motor pulls out of synchronism; and protection of starter or damper winding from overheating when operating at subsynchronous speed. With this starter, motor field can be applied accurately to 99 per cent of synchronous speed, it is noted; also, pull-out protection is adjustable from one to eight poles of slip, eliminating tripping due to transients.

In addition to usual advantages of static controls, this starter has other features. Use of small, lightweight components lets circuits be built on small, functional insulating boards. There are no contacts, bearings and springs, and control is claimed unaffected by contaminated atmospheres.

For more facts circle 624 on Reply Card

Continental

2-PASS DESIGN...



2-PASS AUTOMATIC BOILER GUARANTEES 80% EFFICIENCY ON *EVERY* FUEL

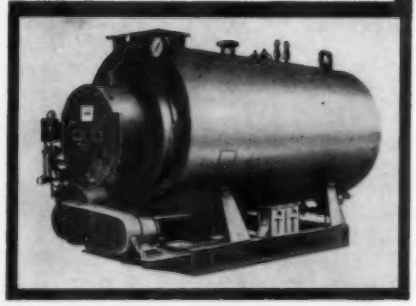
HIGH EFFICIENCY over its entire life is assured by Continental's 2-Pass construction. Continental boilers guarantee 80% minimum efficiency on every oil, gas or combination use of fuel.

SUSTAINED HIGH EFFICIENCY—The simplified Continental 2-Pass design assures brand-new performance for the life of the boiler. High CO_2 is produced, and low stack temperature is guaranteed not to exceed 125°F. above boiler water temperature.

15 to 600 hp Steam Boilers — to 250 psi

Hot Water and HTW Boilers—Oil, Gas, Combination Oil/Gas

For complete data send for Bulletin BE-400



CONTINENTAL BOILER DIVISION
BOILER ENGINEERING & SUPPLY CO., INC.
Phoenixville, Pa.

For more facts circle 625 on Reply Card

NEW PRODUCTS

(Begins on page 216)

Also, due to low power requirements, all power can be obtained from the a-c supply; several supply voltages can be used from a multitap primary on the supply transformer. Thus, a single assembly can be used for most applications without component changes. Because the starter is grouped into functional modules, mounted on separate boards, detection and replacement of defective parts are simplified. Westinghouse Electric Corp.

46—STEEL SULKY SEAT holds weldors on overhead work

Safety, convenience and ease of adjustment are features of this tubular steel sulky for welding operators. It is designed to replace the wooden float or platform slung on ropes, as shown in the left of the illustration. The telescopic sulky comprises a simple perforated steel seat protected by a 9-in. high circular rail of steel stripping. Support for the seat is welded steel scaffold tubing and it carries a curved footrest. The entire assembly rides a tubular steel mast hung on a

bracket straddling the top flange of the girder, the mast being punched at 12-in. intervals to let the sulky be pinned to it at convenient level.

The "bosun chair" can be swung around the mast to any position for vertical, horizontal or overhead welding. Weighing only 45 lb, the sulky can be carried and adjusted by one operator. A safety chain is provided to further protect against a possible fall, and the mast also has adjustable ladder rungs. P. H. Mallog Co.

47—SILICONE LUBE in handy aerosol dispensers

Available in 16- and 6-oz pressurized dispensers, this colorless all-purpose spray is suggested for use on rubber,

To Serve You Better

Pittsburgh Coke & Chemical

has a

NEW CORPORATE LOOK

PITTSBURGH CHEMICAL COMPANY
A Subsidiary of
Pittsburgh Coke & Chemical Company
INDUSTRIAL CHEMICALS · ACTIVATED CARBON
PROTECTIVE COATINGS

UNITED STATES CONCRETE PIPE COMPANY
A Subsidiary of
Pittsburgh Coke & Chemical Company
CONCRETE PIPE · VITRIFIED CLAY PIPE

GREEN BAG CEMENT COMPANY
A Subsidiary of
Pittsburgh Coke & Chemical Company
CEMENT · MORTAR CEMENT

COKE & IRON DIVISION
A Division of
Pittsburgh Coke & Chemical Company
FOUNDRY COKE · PIG IRON · FERROMANGANESE

To more efficiently serve its customers in the processing, construction and metal industries, Pittsburgh Coke & Chemical Company is now manufacturing and marketing its diversified industrial products through three autonomously operating, wholly-owned subsidiaries and one division.

Pittsburgh Chemical Company, a new organization, combines Pittsburgh Coke's Industrial Chemicals, Activated Carbon and Protective Coatings Divisions and their supporting technical departments. The company will concentrate its expanding production and marketing activities exclusively in the chemical and chemical products field.

The products of Pittsburgh Chemical Company's three divisions—*Pittsburgh* Industrial Chemicals, *Pittsburgh* Activated Carbons and *Pitt Chem*® Protective Coatings—are already well known in the nation's processing and maintenance industries.

In these fields, Pittsburgh Chemical will vigorously maintain a policy of planned growth and expansion through (1) intensive new process and application research, (2) alert, personalized sales service and (3) responsive and competent technical assistance.

We believe this policy will inevitably contribute to the growth and profit of Pittsburgh Chemical Company's customers.

PITTSBURGH COKE & CHEMICAL CO.
GRANT BUILDING • PITTSBURGH 19, PA.
Subsidiaries and Divisions
PITTSBURGH CHEMICAL COMPANY • GREEN BAG CEMENT COMPANY
UNITED STATES CONCRETE PIPE COMPANY • COKE & IRON DIVISION

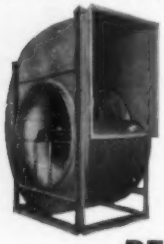
For more facts circle 626 on Reply Card

ANOTHER PEERLESS ELECTRIC SPECIAL BLOWER APPLICATION

How to Stabilize Air-Supported Structures

EVEN IN 70 MPH WINDS, PEERLESS ELECTRIC BLOWERS FIRMLY SUPPORT THESE HUGE ARMY PENTADOMES

Twelve Peerless Electric Centrifugal Blowers, each with a discharge of 22,000 cfm, are responsible for the inflation and support of the Army's hemispheric "Pentadome." Designed for use as missile maintenance centers, the structures tower as high as a nine-story building, cover 17,000 square feet of floor area and hold over a million cubic feet of volume.



Peerless Electric has pioneered the application of inflating and maintaining a variety of air-supported structures, including Radomes. The same skills that engineer air for Pentadomes can go to work for you. Write to *Peerless Electric Division, H. K. Porter Company, Inc., West Market Street, Warren, Ohio.*

PEERLESS ELECTRIC DIVISION

PORTER

H. K. PORTER COMPANY, INC.

PORTER SERVES INDUSTRY with steel, rubber and friction products, asbestos textiles, high voltage electrical equipment, electrical wire and cable, wiring systems, motors, fans, blowers, specialty alloys, paints, refractories, tools, forgings and pipe fittings, roll formings and stampings, wire rope and strand.

For more facts circle 627 on Reply Card

NEW PRODUCTS

(Begins on page 216)

leather, plastic, metal and other surfaces, grears, bushings, bearings, hinges, locks, windows, doors. The non-volatile silicone liquid deposited by the spray penetrates, lubricates and protects, says manufacturer; it stops sticking and squeaking and repels water. Dielectric properties of the spray also suggest its use in lubricating clocks, timers and electronic devices. Krylon, Inc.

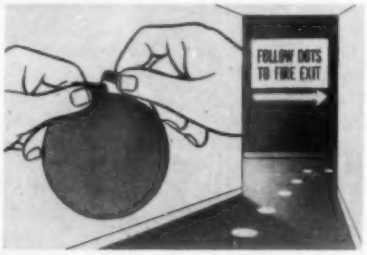
48—VENTILATOR, SKYLIGHT combined in one unit

The Lite-'n-Aire Heat Valve, according to company, is an efficient gravity type ventilator incorporating Fiberglas components to provide quantities of

diffused natural light, whether ventilator damper is open or closed. It gives the benefits of ventilation plus skylighting with just one unit, one roof opening, and one installation cost. Fiberglas components are strong, nonwarping and resistant to weather and many chemicals. Used with automatic operating equipment and grilles, these units have broad application. Swartwout Fabricators, Inc.

49—FLOOR MARKERS lead way to vital locations

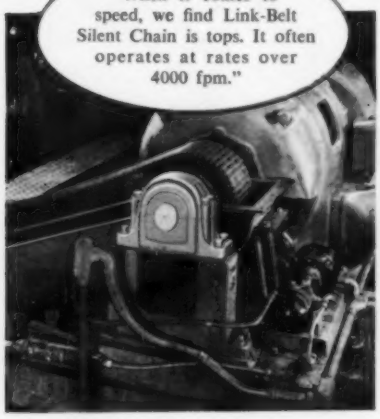
Self-sticking, colored floor markers are the basis of a system for guiding personnel to various points inside the plant buildings. They can be used to

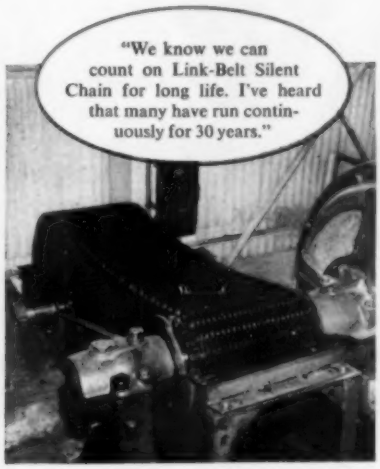


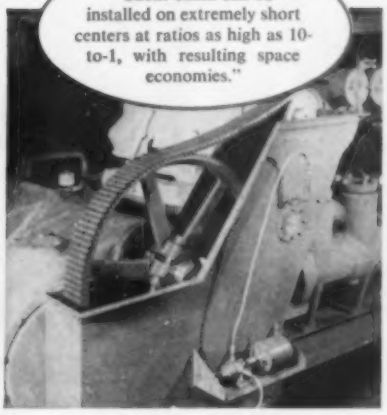
show the way to fire fighting equipment, emergency exits, first aid stations. The circular markers come in bright yellow, red, green and white and are made of 0.005-in. thick vinyl.

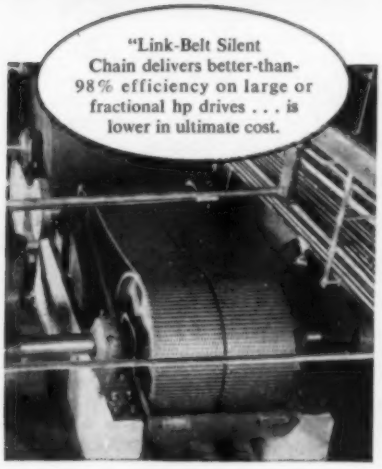
"Join me on a plant tour . . . see why

we're modernizing our drives with Link-Belt Silent Chain"









LINK-BELT

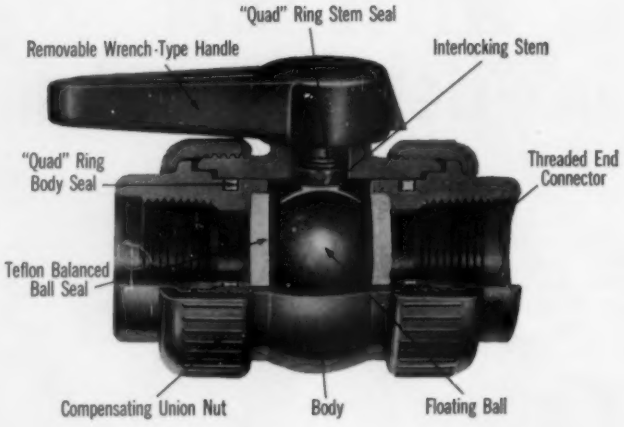
SILVERSTREAK SILENT CHAIN DRIVES

FULL DETAILS on Link-Belt Silent Chain are offered in 88-page Book 2425. Get your copy from your Link-Belt office or authorized stock-carrying distributor. Look under CHAINS in the yellow pages of your phone book.

LINK-BELT COMPANY: Executive Offices, Prudential Plaza, Chicago 1. To Serve Industry There Are Link-Belt Plants, Warehouses, District Sales Offices and Stock Carrying Distributors in All Principal Cities. Export Office, New York 7; Australia, Marrickville (Sydney); Brazil, Sao Paulo; Canada, Scarboro (Toronto 13); South Africa, Springs. Representatives Throughout the World. 15,042

INERT TO CORROSION...

full flow ball valve—¼ turn off!



specify **CHEMTROL PLASTIC VALVES**

for liquid and gas transferring operations.

Here's a complete line of plastic valves that *cuts replacement costs and downtime* wherever acids, alkalies and many solvents are handled! CHEMTROL VALVES feature quick ¼ turn shut-off, no direction change to cause turbulence or loss of pressure, no sticking or scaling, no contamination to pure solutions. Broad chemical resistance as well as good performance in high temperature ranges. With union type end connectors, valves are quick to disassemble and seats are adjustable for takeup.

Available in 5 basic plastic materials and an extensive size range.

CHEMTROL IS THE *LEADER* in plastic valve manufacture... proved over the years! Dealers in all major industrial areas.

Ball Valves

Check Valves

3-Way Valves

Foot Valves

Cock Valves

Globe and Needle Valves

WRITE FOR FREE CATALOG Ask for recommendations!

chemtrol®

CHEMTROL

404 West Central Avenue, Santa Ana, California

For more facts circle 629 on Reply Card

NEW PRODUCTS

(Begins on page 216)

Manufacturer says they won't fade and outlast paint seven to one in tests; they withstand severe truck and pedestrian traffic and are unaffected by oil, grease, acids, salts, cleaning compounds and most solvents. Available as companion products are self-sticking yellow vinyl arrows to be applied over or adjacent to the markers. Samples are offered. W. H. Brady Co.

50—RIVET GUN permits quick and easy assembly

Snapo lets you insert and crimp rivets from the same side, without having to get behind "blind" work surfaces, says manufacturer. This gun, which can be used for almost all sheet metal and mechanical assemblies, eliminates many welding operations, it is noted. Instead of sheet metal screws and

bolts, it uses new rivets reported to cost about a third as much as conventional ones. The gun can be operated with one hand—it weighs only 1 lb, 7 oz. Its clinching action is designed to pull parts together with up to 600 lb of force and countersunk heads leave a flush surface. In operation, the rivet is inserted into the tool, than into the work area; then the handle is squeezed and the fastening job completed. It is pointed out that a minimum number of rivet sizes cover most applications, and that the rivets can be easily removed, if necessary, by placing an electric drill to the rivet head, causing it to fly apart. Costs under $25.00. Richline Co., Inc.

51—MINIATURE SWITCH is economically priced unit

The lower price of Snapac 760—about a third less than many switches of its size and class—is made possible by a new manufacturing technique in which one operation molds the switch mechanism into its phenolic case and a cover is snapped on. In conventional methods, a separately molded phenolic case is hand fitted around the switch mechanism. Snap-

For more facts circle 630 on Reply Card →

GENERAL ELECTRIC

Developed Exclusively for Tri-Clad* '55' Motors

NEW THERMO-TECTOR SYSTEM POSITIVELY

ELIMINATES OVERLOAD BURNOUT

Allows Maximum Motor Output - - Safely!

Now—Tri-Clad '55' motors have simple, direct-acting thermal protectors that *positively* end winding failures from overloads!

New Thermo-Tector heat-sensing switches buried in stator windings react *instantly* to prevent heat damage. Unique Thermo-Tector "anticipation" feature varies motor shutoff point according to rate of winding heat rise. This ends need for operating safety margin.

Thermo-Tector system uses no costly amplifying relays or special circuitry, works with any General Electric motor controller.

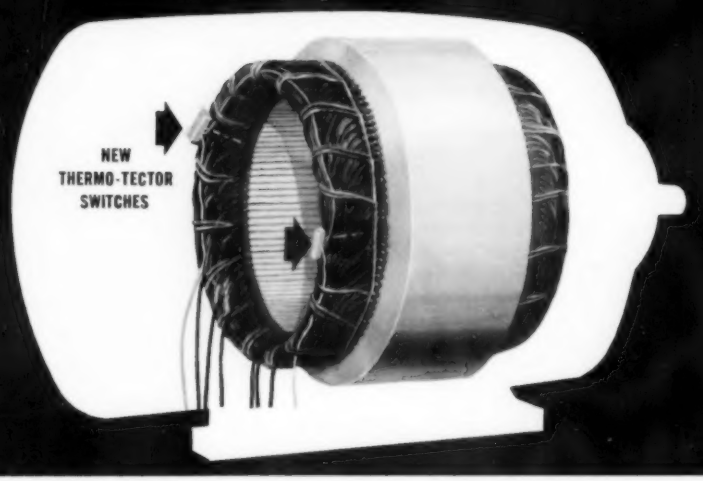
*Registered Trade mark of General Electric Co.

TURN PAGE FOR FURTHER INFORMATION

NOW!

GET MAXIMUM MOTOR OUTPUT WITH NO DANGER OF OVERLOAD BURNOUT!

New THERMO-TECTOR System
Operates IN THE STATOR . . .
Protects Under All Conditions!



You get *full output* from Tri-Clad '55' motors with Thermo-Tector protection. No operating "safety margin" is necessary since Thermo-Tector switches react instantly to prevent damage from *any* type of winding overload. New General Electric Thermo-Tector switches—buried deeply in the coils of the Tri-Clad '55' motor—are so durable they handle size 4 contactor coil current with *no costly amplifying relays* or special circuitry. Any conventional G-E motor controller works with the Thermo-Tector system.

Thermo-Tector protection is available on *all* Tri-Clad '55' motors in frames 254U-445U. For more information, contact your G-E Apparatus Sales Office or write for Bulletin GEA-7092, Section 866-2, Schenectady 5, N. Y.

SMALL AC MOTOR & GENERATOR DEPARTMENT

GENERAL ELECTRIC

NEW PRODUCTS

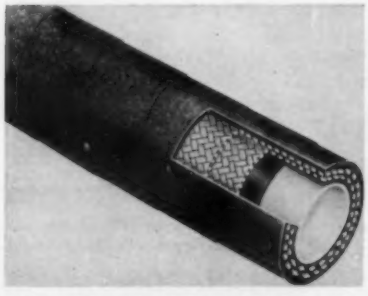
(Begins on page 216)

ac 760, rated 10 amp for across-the-board use in industrial and commercial circuits, is also less than half as large as conventional switch. A single-pole double-throw device, it comes in three types: pin plunger, lever action, and bushing mount. One mounting hole is provided, with provision for gang mounting. Other features announced include positive make-and-break action, high contact pressure. List price is under 70 cents. Appliance and Automotive Div., Controls Co. of America.

One of these products may be "just what you're looking for." Use the handy Reader Service Cards to ask for more information on it.

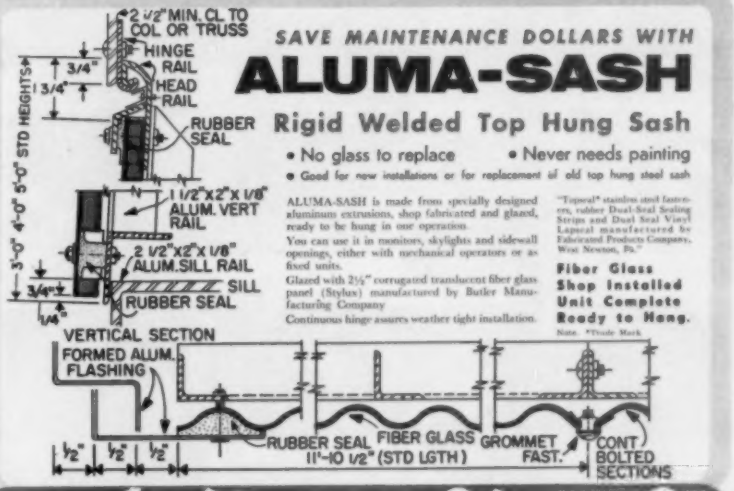
52—TEFLON-LINED HOSE
stands most chemicals

Flexlon withstands all known chemicals except fluorine gas, chlorine trifluoride, and molten alkali metals, according to manufacturer, and has low permeability and zero water absorption. Since nothing sticks to the waxy Teflon tube, cleaning and sterilization are easily done, company points out, and the hose is flexible and easily handled. Flexlon's construction features a bonding of the glossy Teflon tube to the hose body, which is said to eliminate separation, cracking or splitting—even



with small radii. Plies of high tensile cotton cords or braded steel wire, (depending on pressure of temperature) form the strength members, bonded to the tube and heavy-duty cover.

Flexlon is suggested for hot paint and lacquer spraying processes, for flexible connections in process equipment handling corrosives, caking slurries or solvents, and for conveying pharmaceuticals, foodstuffs and other fluids requiring sterilization and easy cleaning. Temperatures to 325 F and



SAVE MAINTENANCE DOLLARS WITH

ALUMA-SASH

Rigid Welded Top Hung Sash

• No glass to replace • Never needs painting

• Good for new installations or for replacement of old top hung steel sash

ALUMA-SASH is made from specially designed aluminum extrusions, shop fabricated and glazed, ready to be hung in one operation.

You can use it in monitors, skylights and sidewall openings, either with mechanical operators or as fixed units.

Glazed with 2½" corrugated translucent fiber glass panel (Stylux) manufactured by Butler Manufacturing Company.

Continuous hinge assures weather tight installation.

"Topseal" stainless steel fasteners, rubber Dual-Seal Sealing Strips and Dual-Seal Vinyl Lapseal manufactured by Fabricated Products Company, West Newton, Pa.*

Fiber Glass Shop Installed Unit Complete Ready to Hang.

Note: *Trade Mark

H. A. Harry Glass Co.

1644 N. MILWAUKEE AVE. • CHICAGO, ILLINOIS

• ALUMA-SASH • REPLASA PANAL

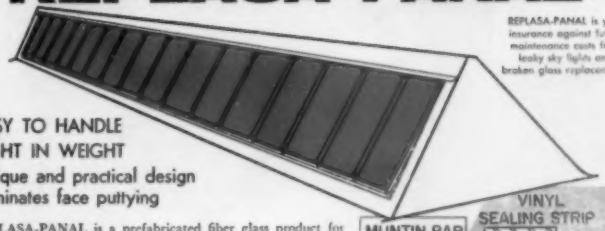
• CORRUGATED GLASS • FIBERGLASS

THIS YOUR PROBLEM?

NEXT TIME

Reglaze for the last time with

REPLASA-PANAL



REPLASA-PANAL is your insurance against future maintenance costs from leaky sky lights and broken glass replacements.

EASY TO HANDLE
LIGHT IN WEIGHT
Unique and practical design eliminates face puttying

REPLASA-PANAL is a prefabricated fiber glass product for replacement of shattered and fractured panes in top hinged, continuous, operated or fixed steel sash. Panels are made to fit the present opening for any make of sash. No cutting, fitting nor mechanical knowledge is necessary.

SALES REPRESENTATIVES

AMERICAN BUILDERS SUPPLY CO.
1044 East Chestnut St., Louisville 4, Kentucky

BRANCH-NICOLOFF COMPANY
549 W. Washington St., Chicago 6, Illinois

HUME SALES, INC.
1900 Euclid Ave., Cleveland 15, Ohio

KRAMER ACCOUSTICAL
1305 - 4th Ave., Moline, Illinois

P. G. McHENRY, JR.
4226 Mackland Ave. N.E., Albuquerque, New Mexico

WAUWATOSA FUEL & SUPPLY CO.
7700 W. State St., Wauwatosa 13, Wisconsin

WEIGAND BUILDING PRODUCTS CO.
5716 Griffith Road N.W., North Canton 20, Ohio

BUILDING SPECIALTIES
2907 Haywood Ave., Chattanooga 5, Tennessee

CONSTRUCTION SERVICES CO.
P.O. Box 3333, Knoxville 17, Tennessee

R. S. MARTIN COMPANY
916 Austin Ave. N.E., P.O. Box 1353, Atlanta, Georgia

W. PAUL CADDELL
1709 - 4th Ave. W., Birmingham, Alabama

BUIE BUILDING MATERIALS CO.
7400 Washington Ave., Houston, Texas

ALUMA GLASS BUILDING PRODUCTS, INC.
739 South Clark, New Orleans 19, Louisiana

H. A. HARRY GLASS COMPANY 1644 Milwaukee Ave., Chicago 47, Ill. Phone: Dickens 2-1660

40 years experience in solving industrial glazing problems.

Please send price information and detail drawings. We are interested in: (check one or both)

☐ Replacement of individual glazing units by plant's own crew (Replasa-Panel)

☐ Replacement of entire sash sections (Aluma-Sash)

Name _____ Title _____

Company _____

Address _____

City _____ Zone _____ State _____

Replasa-Panel & Aluma-Sash—Trade Marks H. A. Harry Glass Co.
Stylux—Reg. U. S. Pat. Off., Butler Manufacturing Co.

For more facts circle 631 on Reply Card

Blaw-Knox Electroforged Grating solves so many problems for so many industries. Catalog free on request. Write

Blaw-Knox Equipment Division, Pittsburgh 38, Pennsylvania.

BLAW-KNOX

GRATING

For more facts circle 632 on Reply Card

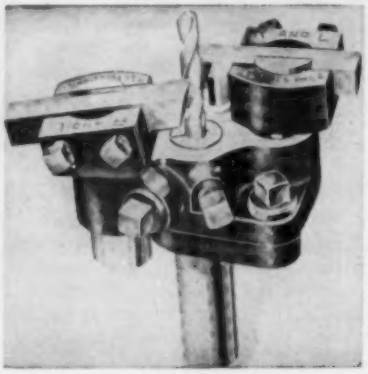
NEW PRODUCTS

(Begins on page 216)

working pressures to 1500 psi are reported acceptable, depending on size and type of hose. It is available in diameters to 1¼ in., 15- to 50-ft lengths. Manhattan Rubber Div., Raybestos-Manhattan, Inc.

53—TURNING TOOL for turret lathe, screw machine

This versatile tool duplicates operations of 14 separate tools, it is announced. It can be changed from a right- to left-hand tool in seconds, says manufacturer, and used as either right- or left-hand balancing turning tool, centering facing or knee



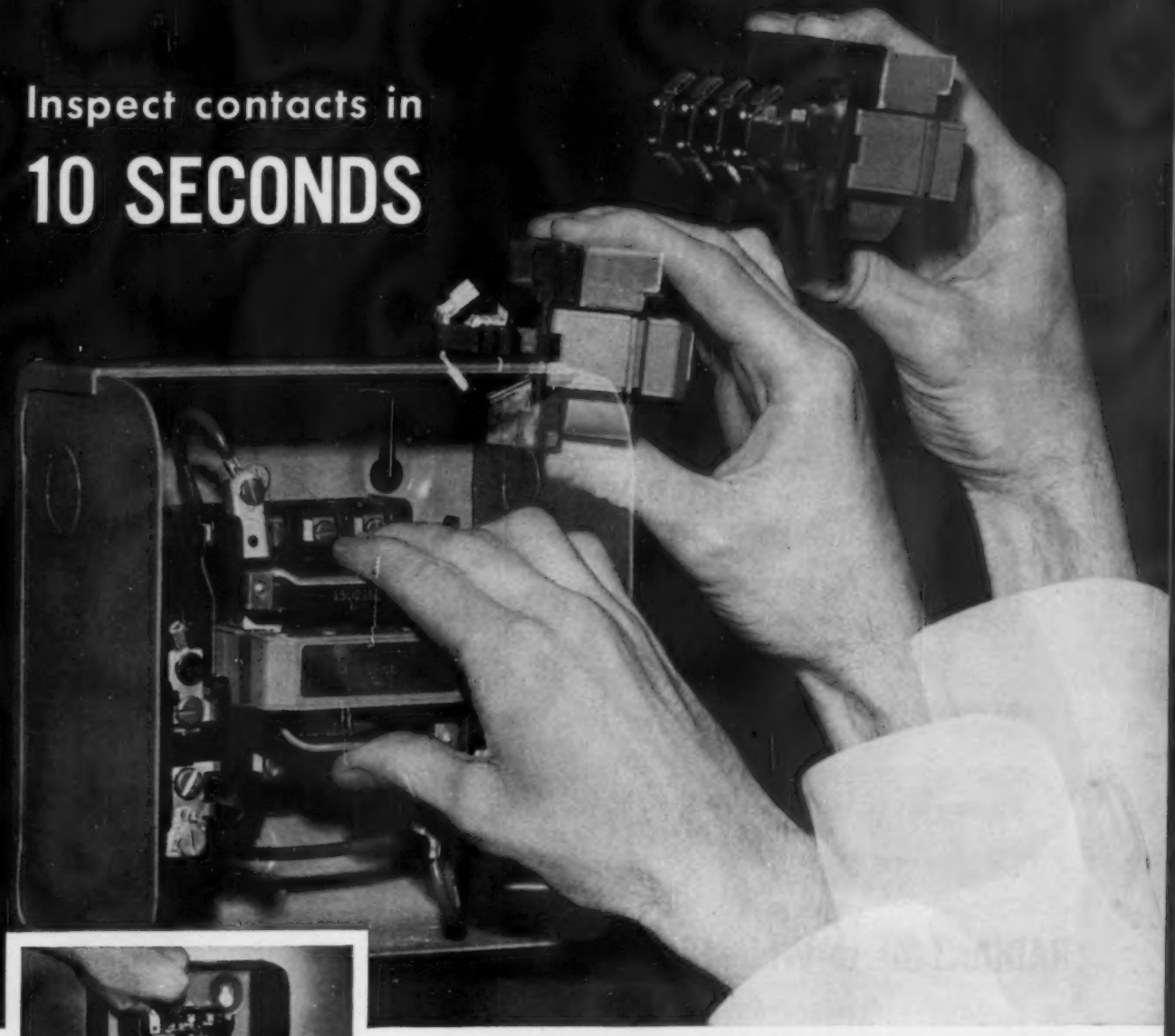
tools, as a backrest, roller box floating drill holder or pointing tool. Setting for various operations are simplified. Operations performed include drilling and chamfering, turning and centering, turning shoulders concentric with stock diameter, turning and forming special spaces on ends of parts while drilling or reaming, turning two diameters while drilling or reaming; turning and chamfering two corners while facing end of part along with drilling or reaming etc. It is noted that the turning and drilling combination is a distinct advantage particularly on simple spindle machines. R and L Tools.

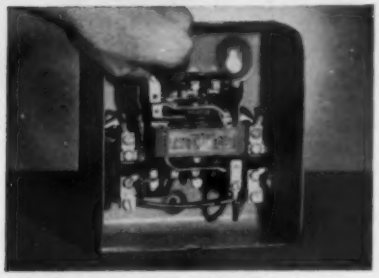
54—COMBINATION STARTER has added safety features

Designed to meet rigid safety requirements with no increase in price or physical size, this combination starter consists of a 100 Line magnetic motor starter, control transformer and branch circuit protective device (disconnect switch or circuit breaker). It is furnished in NEMA Type 12 enclosure, and is available in Sizes 1 and 2. Starter is designed to prevent unauthorized or careless maintenance.

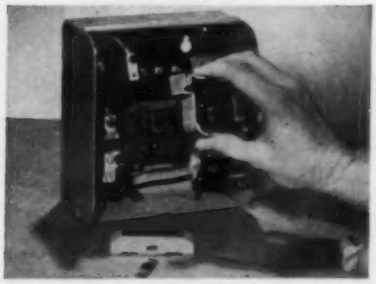
For normal maintenance, main door

Inspect contacts in 10 SECONDS





Lift spring-clamp on coil. The entire magnet and movable contact assembly can now be easily removed without disturbing any wiring on the starter.



Coil change can be accomplished by simply removing magnet spring clip and lifting off "I" magnet and coil.

Snap-slide construction of General Electric 100-Line Magnetic Starters cuts inspection time by two-thirds

In your normal plant operation, how much time is spent inspecting magnetic starters—either as part of a planned maintenance program, or in locating the cause of breakdowns?

With General Electric 100-Line Magnetic Starters, you can save up to two-thirds of the time and money normally required for this operation. The tested reliability of G-E 100-Line starters means fewer breakdowns . . . and if parts replacement is required it can be accomplished in measurably less time.

General Electric's exclusive snap-slide construction makes faster inspection and replacement possible. In just 10 seconds you can remove the entire magnet and movable contact assembly. Just lift the spring clamp on the coil and lift out the assembly. There's plenty of working room and no tools are necessary. There are no screws to take out and no wires to remove.

Ask your General Electric distributor for new bulletin GEA-7020, or write General Electric Company, Schenectady, New York. 813-25

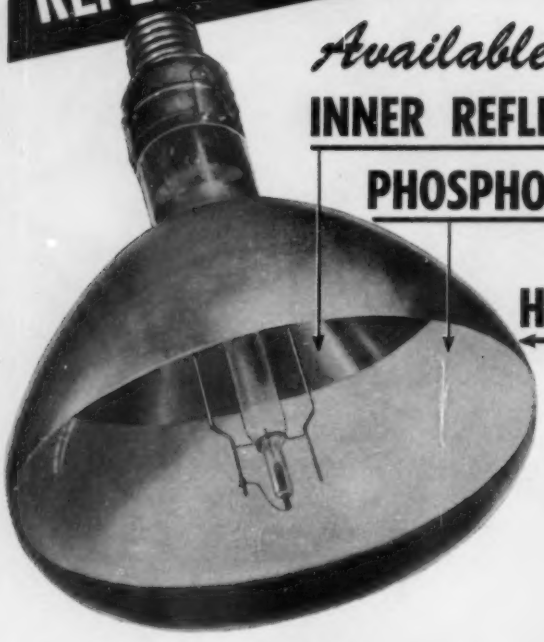
you get **MEASURABLE ADVANTAGES**
WITH GENERAL ELECTRIC CONTROL

Progress Is Our Most Important Product

GENERAL ELECTRIC

For more facts circle 633 on Reply Card

RADIANT CREATES NEW REFLECTOR MERCURY LAMPS



Available Now!

INNER REFLECTOR *plus*

PHOSPHOR COATING

and

HARD GLASS

- **R80** *1000W & 700W*
- **R60** *400W & 250W*

RADIANT Merco-White High Beam features

- ★ Protected inner reflector; highest reflection factor.
- ★ Phosphor coating provides good color improvement.
- ★ Highest percentage of *delivered* lumens to work area.
- ★ Higher initial and maintained illumination.
- ★ Eliminates expensive, heavy fixtures. Reduces installation costs.
- ★ Hard glass (Pyrex) withstands thermal shocks.
- ★ Combines two light patterns, narrow and wide, for complete coverage.

★
National distribution
Lighting layout service
Favorable discounts

Contract Prices Without a Contract

INDOOR Extra High Bays

Can use porcelain socket by itself in most locations.

OUTDOOR Installation

Can use lightweight, inexpensive lamp holder.

Send for Bulletin 89

RADIANT LAMP CORPORATION
Industrial Lamp Specialists Since 1938

300 Jelliff Avenue Newark 8, N. J.

CHICAGO DETROIT LOS ANGELES SAN FRANCISCO PORTLAND, Ore.

Originators of Reflector Type Hard Glass R40, R60 & R80 Incandescent Lamps

For more facts circle 634 on Reply Card

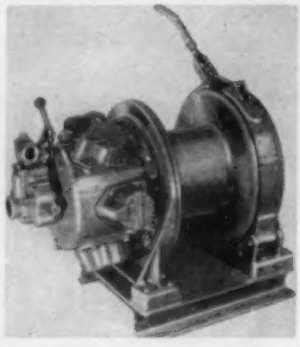
NEW PRODUCTS

(Begins on page 216)

can be opened with a tool only when disconnect switch or circuit breaker is in "off" position. With door open, switch can only be closed by operating a defeater mechanism. Doors cannot be closed when switch is on, and switch can be turned on only with door closed and latched. Emergency mechanisms provided enable authorized personnel to check starter without shutting down motor. Same enclosure and switch handle are used with either circuit breaker or disconnect switch form and can be interchanged. General Electric Co.

55—UTILITY HOISTS of greater handling capacity

K6U and K6UA are announced as air powered single drum units taking maximum loads of 7000 and 5000 lb, but retaining the portability and adaptability of smaller hoists. They are designed to handle the heavier loads



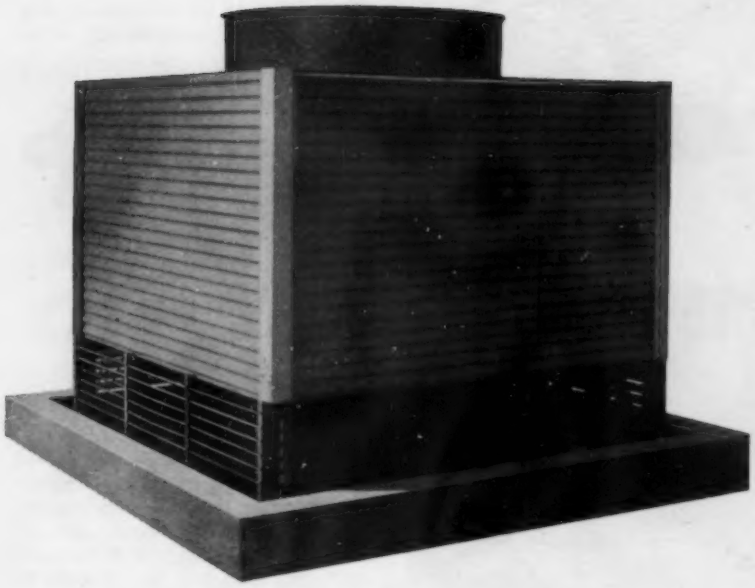
of erection, maintenance and materials handling jobs without multiple reeving. Both hoists have reversible six-cylinder air motors with infinite speed graduation provided by the throttles. A self-energizing brake supplements the reversible motor. At 80 psi air pressure, the K6U has a rated capacity of 7000 lb with an average lift speed of 65 fpm; the K6UA, 5000 lb and 95 fpm. Drum capacity of each is 600 ft of ⅝-in. wire rope or 400 ft of ¾-in. rope. Form 5274 gives details. Ingersoll-Rand Co.

56—PENCIL leaves its mark on polyester film

Created especially for making tracings on polyester-based film, the FTR (film tracing reproduction) Pencil uses a lead compounded of new resins, super-fine graphites and some plasticizers which block out light to leave on copy prints drawings of black ink clarity. The FTR has a dark gray metallic finish of silver foil and is

For more facts circle 635 on Reply Card

FLUOR COOLING TOWERS



higher thermal performance

lower maintenance cost

built-in permanence

etc. *

* The et ceteras make profitable reading. Would you like a free copy of our catalog that describes in detail the designed quality of Fluor towers?

CTI

Fluor PRODUCTS COMPANY

INDUSTRIAL COOLING TOWERS

A division of The FLUOR CORPORATION, Ltd.

GENERAL OFFICES:
SANTA ROSA, CALIFORNIA

For more facts circle 635 on Reply Card

WATCH THIS

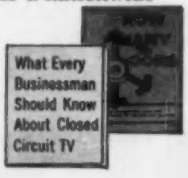
Inside Open Hearth Furnace At Steel Mill

On GPL Closed Circuit TV

- Training • Production Control • Surveillance
- Property Protection • Material Handling
- Dangerous Viewing • Traffic Control • Work Coordination
- Process Control • Centralized Record Viewing

GPL, first in closed circuit TV sales, can provide a reliable, high-quality system for you at surprisingly low cost. GPL maintains a nationwide sales and service network for your convenience.

To learn why more and more of the nation's industrial leaders are turning to GPL Closed Circuit TV, write for FREE brochures, "How Many Jobs" and "What Every Businessman Should Know About Closed Circuit TV."



GPL DIVISION
GENERAL PRECISION, INC.
PLEASANTVILLE, NEW YORK

For more facts circle 636 on Reply Card

NEW PRODUCTS

(Begins on page 216)

silver capped at one end. It comes in six degrees of lead hardness, is packaged twelve to a box. The box, of transparent acetate, doubles as a desk tray. Joseph Dixon Crucible Co.

57—AIRLESS SPRAY GUN gives quality atomization

The H-Gun is announced as an airless spray gun offering spray atomization quality equal to air atomization. Operating from a conventional airless

system, gun is said to provide a spray pattern with full feathered edges and balanced material distribution. Served by the company's standard HydraAirless-20 system, gun will spray lacquer, varnish and enamel work, may be used for wide or narrow patterns, in small enclosures and for all types of wood and metal products. Hammertone finishes as well as conventional vinyls, oil base and red lead materials may be sprayed. The Spee-Flo Co.

58—TWO-WIRE CONTROL offers efficiency, economy

Varelectric is a two-wire supervisory control system announced as providing direct, instantaneous control of pumps motors, valve operators and similar equipment. It is designed to continually supervise and indicate the status of the controlled device and use only one wire between each control and field unit, plus one conductor common to many units. Since Varelectric needs only two wires, it offers economy in process applications, manufacturer points out, cutting field wiring costs to as little as 25 to 15 per cent of those of conventional systems which sometimes require seven to nine wires between units.

Basic principle of operation involves inherent polarization characteristics of a d-c power source for remote control and ability of a Wheatstone bridge circuit to recognize conditions and

Handling Hot Fumes? Bifurcate 'em!

A protective housing shields a DeBOTHEZAT Bifurcator® motor from contact with hot and corrosive fumes. Special alloys for housings and fan wheels are available for extremely corrosive fumes. The result: smoother operation and lowered motor maintenance costs. In-the-duct installation of DeBOTHEZAT Bifurcator Fans saves valuable space and ends sharp-corner deflection of exhaust flow. Friction is reduced and velocity increased.

Direct-drive DeBOTHEZAT Bifurcator Fans economize fume removal problems in a wide variety of applications. Contact a DeBOTHEZAT engineer NOW or write Dept. PE-560.

De Bothezat® FANS

A DIVISION OF

American Machine and Metals, Inc.

EAST MOLINE, ILLINOIS

IN CANADA: Represented by DOUGLAS ENGINEERING, LTD., Toronto • Montreal

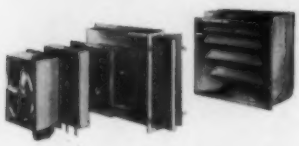
Divisions of American Machine and Metals, Inc.

TROY LAUNDRY MACHINERY • RIEHLE TESTING MACHINES • DE BOTHEZAT FANS • TOLHURST CENTRIFUGALS • FILTRATION ENGINEERS • FILTRATION FABRICS
NIAGARA FILTERS • UNITED STATES GAUGE • RAHM INSTRUMENTS • LAMB ELECTRIC COMPANY • HUNTER SPRING COMPANY • GLASER-STEERS CORPORATION

For more facts circle 637 on Reply Card

Your best investment in modern air-handling equipment! New Aerovent Air Make-Up Units provide clean, fresh air in winter or summer; help maintain uniform temperature levels throughout working areas. Used as filtered-air supply units or air preheaters, these versatile units permit heating and ventilating systems to operate at design efficiency; equalize negative pressures by replacing exhaust air.

Steam, hot water or gas-fired models in sizes 18" to 54" (larger units available on order) for capacities, pressure conditions and BTU ratings to suit your requirements. Compact, packaged design for roof or wall mounting. Other assemblies also supplied for exclusive use in air supply or air heater applications. Why not investigate the many advantages of these high-efficiency units, today?



STEAM OR HOT WATER

Furnished in 7 unit arrangements in sizes 24" to 54". Capacities from 5,000 to 35,000 CFM. Roof or wall types for all requirements.

GAS-FIRED

Supplied in 4 unit arrangements for roof or wall mounting. Sizes 36" to 54" for various capacities, BTU ratings and pressure conditions.

Write for new Bulletin 880

Air deliveries of all Aerovent equipment are tested and rated in accordance with established and accepted codes and each unit is guaranteed by the manufacturer to deliver its rated performance.

CERTIFIED PERFORMANCE

Aerovent

Aerovent FAN COMPANY, INC.

Ash and Bond Streets — Piqua, Ohio

For more facts circle 638 on Reply Card

NEW PRODUCTS

(Begins on page 216)

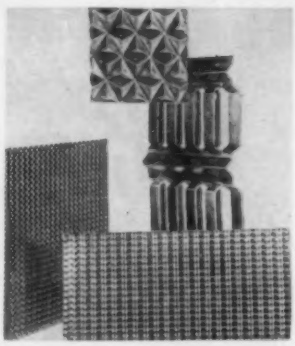
direction of unbalance. Wiring is not critical and the signal is a direct, continuous current. No power is required at the field end. Varelectric is intended for new installations or additions and supplements to existing ones. Vapor Recovery Systems Co.

59—RESET TIMER controls eight operations

Model 8AZC is a multi-unit reset timer panel designed to automatically control eight sequential operations. Each timer is calibrated from 0 to 60 sec. Timing ranges up to 10 min can be supplied. Timer is also available as Model M2ZC for dual timing operations and Model MZC for single operations. Details on these reset timer panels are given in Catalog 18-A. Zenith Electric Co.

60—ALUMINUM SHEET in colorful 3-D patterns

Alcoa 3-D Sheet includes four three-dimensional patterns. As illustrated, from top to bottom, they are called Egyptian, Offset, Regent and Baguette.



Each comes in 11 colorful Alumalure finishes and aluminum pigments have been added to some hues for additional luster. The sheet is expected to find applications where texture, color and design are paramount—building facades, spandrel panels, handrail panels, ceiling panels etc. All designs come in a single standard alloy and temper, are 4 by 8 ft in size. Aluminum Co. of America.

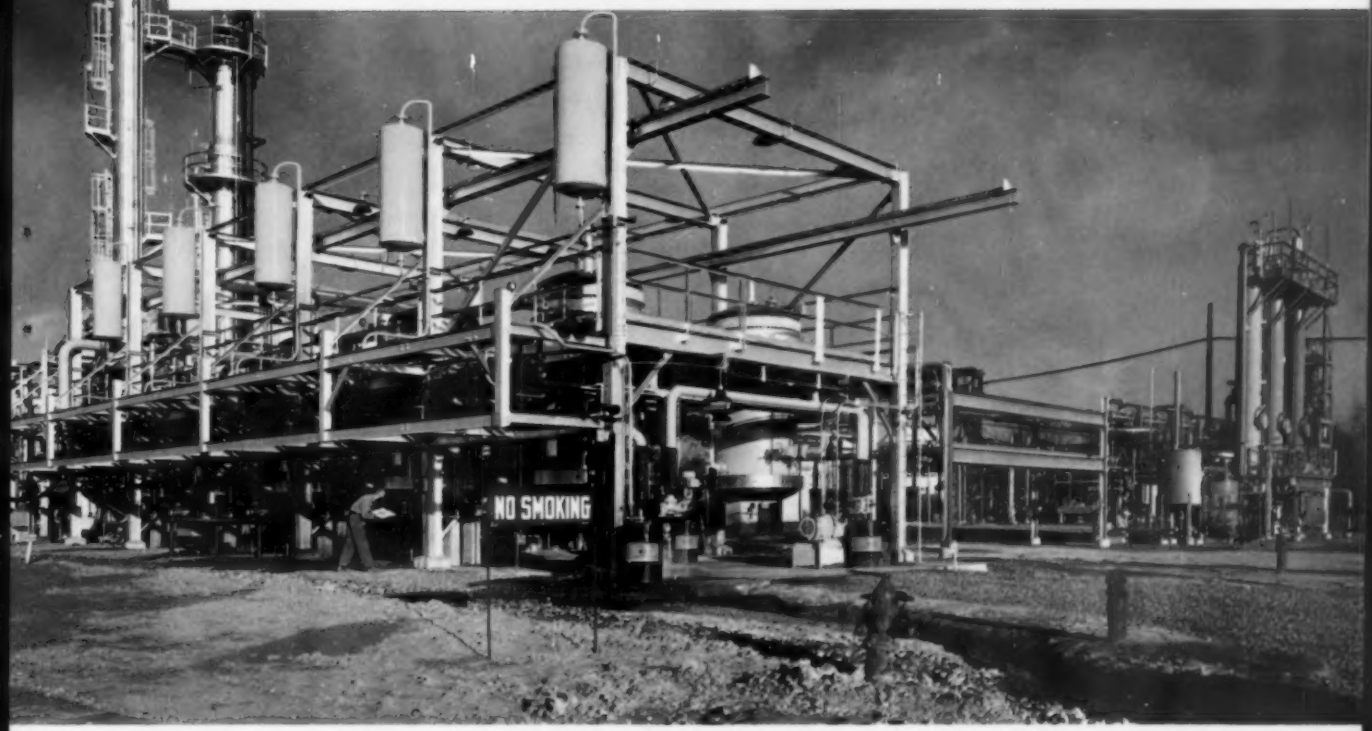
61—DISPOSAL UNIT treats the chromium wastes

Chromator Model 3340, a package unit, includes all necessary tanks, pumps, mixers and controls for treating up to 600 gph of plating room chromium wastes. It collects chromium rinse water in a sump and pumps

For more facts circle 639 on Reply Card →

CORROSION PROTECTION

In Depth . . . With Color!



Wherever your plant and equipment are subject to critical acid, alkali or solvent exposures even at elevated temperatures, high humidity, severe weathering — or any combination of these — one of Truscon's corrosion control systems will provide maximum protection at lowest cost per square foot per year.

Truscon will also provide guidance in proper surface preparation, coating application, and inspection. For a detailed, written specification on protection of steel, iron, aluminum, concrete, and other surfaces, call the Truscon branch nearest you, or write Truscon Laboratories for specific information.

TRUSCON *Laboratories*

Industrial Maintenance Division of Devoe & Raynolds Co., Inc. • Detroit 11, Michigan

Is there an all-purpose steam trap to meet all requirements? There is no existing single purpose trap to answer all trapping problems. Instead, Anderson offers four different trap designs, each engineered for a definite type of application.

For your general purpose applications, the answer is Super-Silvertop Steam Traps. Where fast heating-up is required, Anderson Heat-Kwik Combination Open Float or Thermostatic Traps are without an equal. Ideal for outdoor, freeze-proof installations, insist on our Quik-Flex Thermostatic Steam Traps. For draining condensate from steam or moisture from air and gas equipment, Anderson continuous flow type Float Traps are unbeatable.

For the highest efficiency in traps for all purposes, make your selection from Anderson's complete line of traps. Mail coupon for our engineering catalog, "How To Select Steam Traps and Other Fluid Specialties".

A TRAP FOR EVERY PURPOSE

THE V. D. ANDERSON COMPANY
division of International Basic Economy Corporation
1939 West 96th Street • Cleveland 2, Ohio

Please send a copy of your new engineering booklet, "How to Select Steam Traps and Other Fluid Specialties".

Name_____ Title_____
Company_____
Address_____
City_____ Zone_____ State_____

ANDERSON *SUPER•SILVERTOPS*

For more facts circle 640 on Reply Card

NEW PRODUCTS

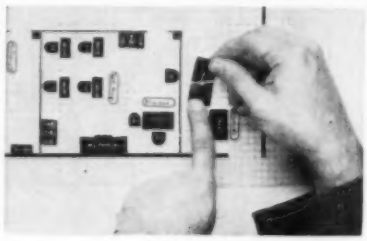
(Begins on page 216)

this into an eight-compartment mixing, reaction and settling tank. Here sodium metabisulphate, sulphuric acid and caustic are automatically metered into waste to reduce hexavalent chrome to trivalent and to regulate pH to between 7 and 8. The unit is reported easily installed, requiring no changes in floors, drains or other structures. It operates automatically, company states, and wastes treated can be dumped into municipal sewer systems or streams. Motors, pumps and controls are prewired, ready for operation on 220/440 three-phase power. George L. Nankervis Co.

Use the Reader Service Cards provided on pages 295-296 to ask for more information on these products. Circle item numbers of the products in which you are interested.

62—LAYOUT KIT aids in planning plant offices

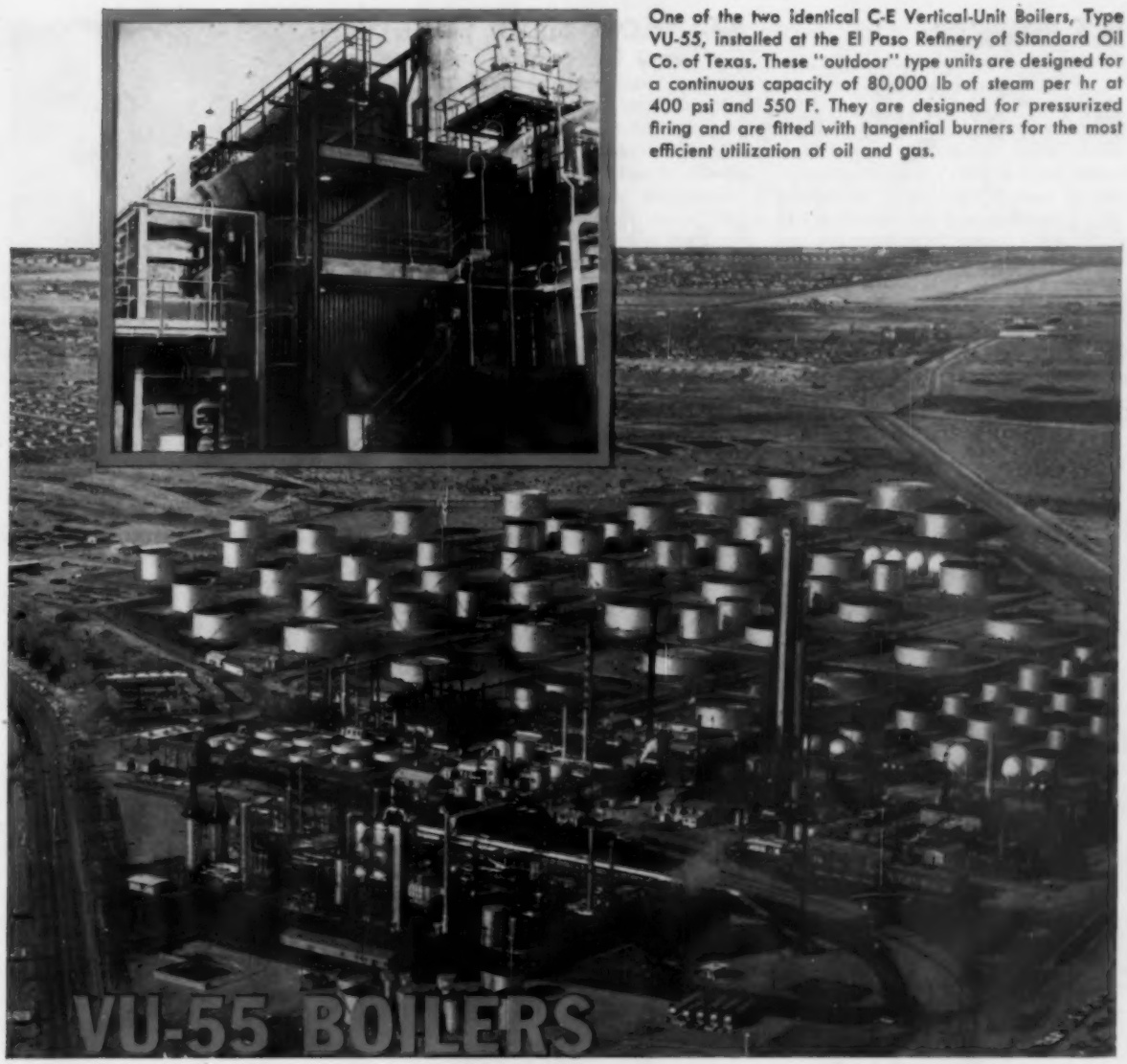
This layout kit consists of a 20-by-50 in. plastic planning board with grid, a marking pencil, tape, and representative symbols for every type of office furniture and equipment (48



different size templates, over 200 pieces). Self-adhering vinyl symbols are placed on translucent plastic grid board by hand. According to company, they adhere until removed (with a flick of a finger) and can be reused indefinitely. Kit is available with grids scaled ⅛ or ¼ in. to the foot, in black or in a non-photographic blue. Planoramics, Inc.

63—PROTECTIVE COATING for plant machinery

Tropoxy No. 2 Clear is designed to protect machinery and other plant equipment against severe chemical and fume conditions. When it is applied to inside or outside surface of metal, wood, concrete or plaster, most caustic and corrosive materials have



One of the two identical C-E Vertical-Unit Boilers, Type VU-55, installed at the El Paso Refinery of Standard Oil Co. of Texas. These "outdoor" type units are designed for a continuous capacity of 80,000 lb of steam per hr at 400 psi and 550 F. They are designed for pressurized firing and are fitted with tangential burners for the most efficient utilization of oil and gas.

Handle Load Swings Smoothly

...chosen for dependability

In 1955, the Standard Oil Company of Texas made a substantial addition to steam generating facilities at its El Paso Refinery. It placed in service two C-E Vertical-Unit Boilers, Type VU-55.

These units have proved to be the keystone of the refinery's steam supply as they were soon recognized for their exceptional ability to handle load swings and to meet overload demands smoothly and efficiently.

There are several other boilers at the El Paso Refinery, including two other C-E units of smaller size, but the VU-55's have established the best record for reliability and ease of operation. As a matter of fact, the VU-55 Boiler, especially designed for use with oil or gas fuel, is making a consistently good record in numerous installations both in this country and abroad. So – when you are in the market for a new boiler – oil or gas fired – in a capacity range from 70,000 to 150,000 lb of steam per hr – investigate Combustion's VU-55.

COMBUSTION ENGINEERING

Combustion Engineering Building, 200 Madison Avenue, New York 16, N. Y. Canada: Combustion Engineering-Superheater Ltd. C-265

ALL TYPES OF STEAM GENERATING, FUEL BURNING AND RELATED EQUIPMENT; NUCLEAR REACTORS; PAPER MILL EQUIPMENT; PULVERIZERS; FLASH DRYING SYSTEMS; PRESSURE VESSELS; SOIL PIPE

For more facts circle 641 on Reply Card

(Begins on page 216)

little or no effect on the clear, high-gloss finish, according to manufacturer. Used in heavy work areas, coating is said to withstand hammering and pounding, and its adhesive qualities resist damage from bumping and scraping. It protects floors of wood, tile or concrete from most dripping or spilled chemicals, company says, and may be applied to inside of tanks containing acids, alkalis, solvents, fats, salt solutions, etc. Tropical Paint Co.

64—PILLOW BLOCK permits easy liner replacement

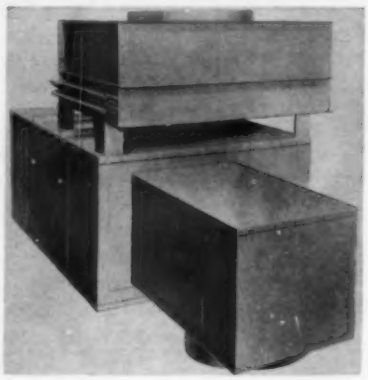
Bronze precision liners can be replaced easily in these pillow blocks, it is announced. The new sleeve bearings are suggested for use where shock loads, elevated temperatures and corrosive conditions are anticipated. It is possible to replace a worn bushing, or liner, without removing the bottom half of the housing from its support, company states; only the cap of the block is removed, (as shown)—the shaft being lifted just enough to let the lower half of the liner be loosened and slipped out. A new bronze

liner can then be inserted and seated by tapping lightly. The cap liner is also replaceable. No screws are required. A brass retainer spool between cap and base of housing serves to prevent rotation of liner with shaft.

The new bronze-bushed line includes split journal bearings (two-bolt) for standard power transmission shaft sizes from 1-15/16 to 2-15/16 in.; rigid pillow blocks (four bolt) for shafts from 3-7/16 to 8 in., and angle pillow blocks for standard transmission shafts. For heavy-duty service, these bronze-lined blocks are designed to withstand high temperatures, relatively high shaft speeds, shock and pressure. Dodge Mfg. Corp.

65—ROOF MOUNTED UNIT provides heating, cooling

Because it is roof-mounted and air-cooled, this 10 ton cooling-heating combination frees floor space for other operations, and offers maintenance benefits as well, maufacturer points out. The gas-fired heating system providing 240,000 Btuh output is contained within the unit, which is said to be particularly suitable for heating and cooling one-story structures requiring a simple, economically installed system. Only simple fuel and electrical connections are needed for installa-

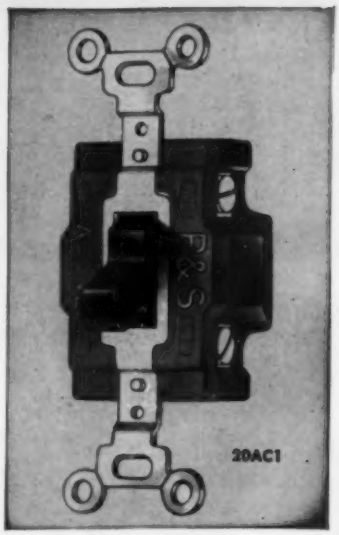


tion, and an air distribution plenum and diffuser, to carry air to and from building interior, is supplied. Provision of intake and discharge connections through end permits placing unit over

SPECIFIED
FOR RUGGED DUTY

OVER AND OVER AND OVER AGAIN

P&S
SUPER
AC
SWITCHES

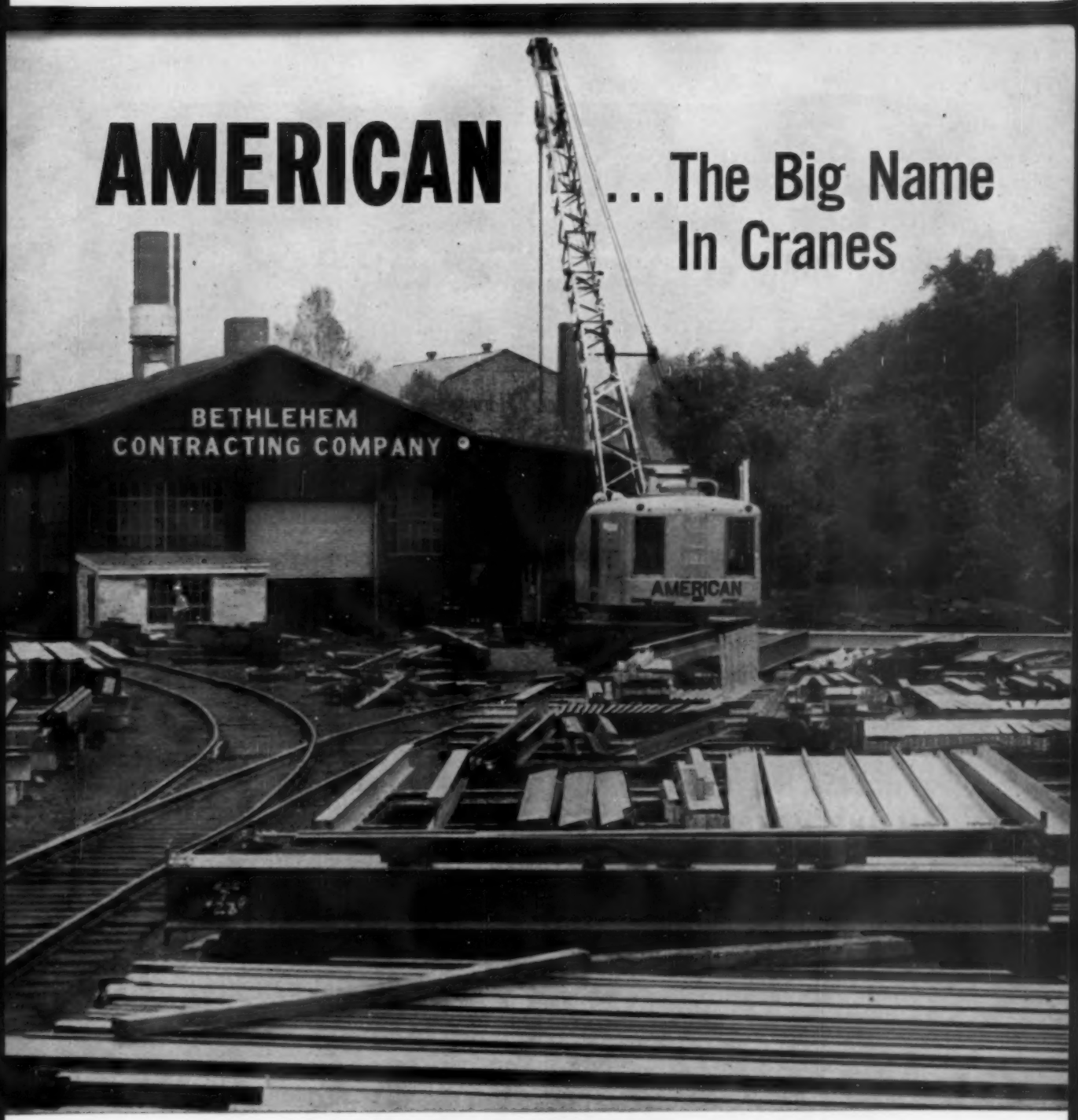


- Extra large terminal screws.
- Back or side wired.
- Extra large silver buttons.
- Can be used to *full rated capacity* on inductive loads.
- Heavy plastic body.
- Contacts in upright position mounted at point of least vibration.
- Available in 15 and 20 Amp. types.

Send for complete catalog. Dept. PE-56

P&S
PASS & SEYMOUR, INC.
SYRACUSE 9, NEW YORK
60 E. 42nd St., New York 17, N. Y. 1440 N. Pulaski Rd., Chicago 51, Ill.
In Canada: Renfrew Electric Co., Ltd., Toronto Ontario

MAKE THE COMPLETE JOB COMPLETELY P&S
For more facts circle 642 on Reply Card



Write for detailed, illustrated information showing how versatile American Truck and Crawler, Self-propelled and Locomotive Cranes (American DiesELectric,® above) are engineered to give you trouble-free, high volume materials handling service.

AMERICAN HOIST
and Derrick Company
St. Paul 7, Minnesota

EXCAVATORS-CRANES to 2 yds.-60 tons
LOCOMOTIVE CRANES to 130 tons

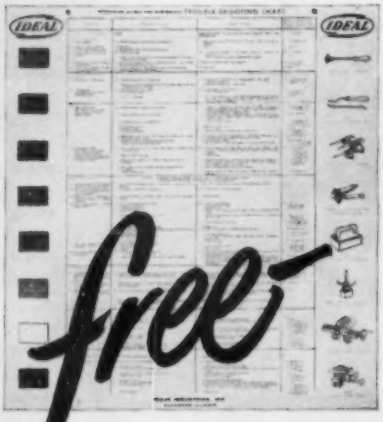
DERRICKS-HOISTS to 800 tons
REVOLVER CRANES to 400 tons

CROSBY-LAUGHLIN DIVISION
Forged fittings for wire rope-chain

For more facts circle 643 on Reply Card

IDEAL

TROUBLE-SHOOTING WALL CHART



free

tells how to use IDEAL PREVENTIVE MAINTENANCE TOOLS to cut your D. C. motor operating costs

GET YOUR COPY NOW
... send coupon

IDEAL INDUSTRIES, Inc.
3879-E Park Ave., Sycamore, Ill.

Send me free Ideal Trouble-Shooting Wall Chart.

Name_____

Company_____

Address_____

City_____ Zone____ State_____

... Sold Through America's Leading Distributors ...

For more facts circle 644 on Reply Card

NEW PRODUCTS

(Begins on page 216)

weight-bearing building members—not necessarily over space served—and running ductwork to diffuser. Compactness is another advantage of unit —90-by-60 in., 80 in. high. Typhoon Air Conditioning Div., Hupp Corp.

66—STATIC CONTROL for all logic functions

Called Norpak, this static system based on the the transistor NOR unit, is designed for fast performance of all logic functions, including AND, OR, NOT and MEMORY, providing rates up to 25,000 per sec. Logic

elements are packaged in space-saving modules and encapsulated for resistance to shock and environmental conditions. Components can be purchased separately, in six or 20 packs, and can be applied as desired without regard to phase sensitivity. Norpak is also available in completely engineered systems. Optional monitor lights give visual indication of proper performance, and a simple dynamic sequence testor checks individual NOR units in operation. Square D Co.

67—WIRE ROPE SLINGS offer safety, strength

Double Green Stripe, ACCO-Registered VHS Strand-Laid Wire Rope Slings—claimed the world's strongest —are made from high carbon steel. Their higher tensile strength makes possible a stronger product without increased rope diameters. These slings keep their shape under pressure and withstand more shock and abrasion, company states, and because of preforming, they cannot become hide bound or lose flexibility. All slings in the series have streamlined Duoloc wire rope endings. Duloc is designed to permit use of preformed wire ropes with independent wire rope centers; to retard fatigue and absorb vibration, and to lock for the life of the rope.

down went heating costs by 35%

with Dravo *Counterflo* Heaters

Learn how one company switched to Dravo *Counterflo* warm air space heaters and reduced their heating bill by more than $6,000 per year. Plant is warmer, too, and 3,400 square feet of valuable space were made available for manufacturing.

Use the coupon for full details.

DRAVO CORPORATION
Department P-12, Room M-214
Pittsburgh 25, Pa.

Send me free copy of 12-page report on warm air space heating and the facts on the company mentioned above.

Name_____

Position_____

Company_____

Address_____

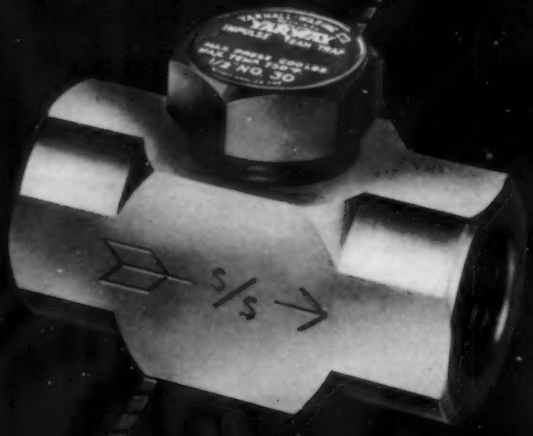
City_____

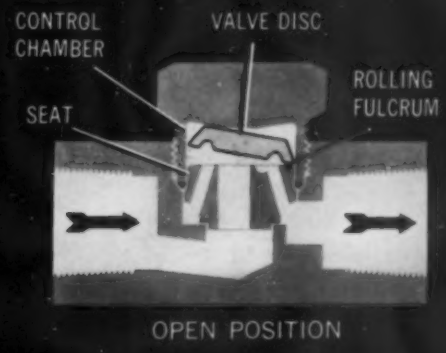
Zone____ State_____

DRAVO
CORPORATION

For more facts circle 645 on Reply Card

Do your steam traps give you these 3 advantages?





1. Economy of operation on light loads?

The Yarway No. 30 gives you closer control—discharges condensate at full capacity, closes immediately on steam.

2. Longer service life?

Yarway's lever action reduces impact on valve seat—lessens wear, gives longer operating life. Quieter operation, too!

3. Lower maintenance?

Only Yarway offers an Impulse trap with renewable seat and disc that *can be replaced without removing the trap from the line.*

Why settle for less? Get all three money-saving advantages with Yarway No. 30—plus these time-proven advantages of all Yarway Impulse traps: quick heat-up, even temperatures, small size, stainless steel construction, non-freezing.

Nearly 1,300,000 Yarway Impulse traps already installed. Stocked and sold by 270 Industrial Distributors. Ask *your* distributor to arrange a free 90-day trial in your plant. Or write us.

YARNALL-WARING COMPANY
100 Mermaid Ave., Philadelphia 18, Pa.

YARWAY
A MARK OF QUALITY IN STEAM ENGINEERING

For more facts circle 646 on Reply Card

Remove Damaging
OIL, WATER and DIRT
from compressed air lines . . .
***New* WILKERSON**
"WHIRLFLO"

For air lines ¼" to 5" P.T.
With or without pipe flanges.

Exclusive features of NEW Wilkerson "WHIRLFLO"

★ Metal bowl or transparent bowl.

★ "Micro-Pruf" cartridge completely removes oil and particles as small as 3 microns—lasts 4 times longer.

★ 200% greater CFM capacity. Maximum pressure 250 PSI with metal bowl.

Put the "WHIRLFLO'S" double-barreled action to work for you.

1. Centrifugal force from special baffle vane sends contaminants to walls of cylinder away from cartridge from where they drain into sump.
2. Then separated air flows through "Micro-Pruf" cartridge. This 2-stage action cleans better and adds months of life to cartridge.

SAVE
on maintenance and operation.

1. The cartridge lasts 4 times longer than others.
2. Cartridge is easily replaced by removing one nut while unit remains on pipe line.
3. Addition of automatic petcock eliminates human failure to drain, keeping cartridge from water level.

WRITE TODAY FOR COMPLETE INFORMATION ON THE EFFICIENT, MONEY-SAVING WILKERSON "WHIRLFLO".

WILKERSON CORPORATION

Dedicated to keeping the NEW in pNEUmatics
1638 W. Girard, Englewood, Colo.

For more facts circle 647 on Reply Card

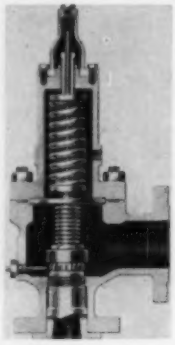
NEW PRODUCTS

(Begins on page 216)

Having a safety factor of approximately 5:1, these slings come in 20 diameters from ¼ to 3 in. Vertical lifting capacities are from 1350 lb for the smallest sling, to 166,000 lb for the largest. Wire Rope Sling Dept., American Chain & Cable Co., Inc.

68—BELLOWS RELIEF VALVE for vapor service

Series DB Valves are bellows units designed to keep corrosive and viscous fluids away from working parts and provide a balancing action against a variable back pressure. Foremost among features announced is a Saf-T-Alarm to warn of bellows rupture; it can be self-contained or furnished for remote control. Interchangeability



with conventional one-ring valves is another feature. Also, the cap arrangement of this valve provides a bolted cap as standard and is interchangeable with a packed cap. The cap contains provision for gagging without taking the valve out of service. The knock-out nozzle, designed for easy replacement, can be slipped out of the valve when the holding nut is split with chisel and hammer. Bulletin V-100/60 gives details. J. E. Lonergan Co.

69—SLIDING TAPE in "test it yourself" kit

This introductory "industrial pack" is offered to acquaint plant engineers with Nyl-O-Tape, a self-adhering solid nylon sliding tape. Containing a 6-ft length of each of five standard widths, from ¼ to 1 in., this pack lets you try the various widths for in-plant applications; it costs under $7.00. In woodworking and metalworking industries, the tape is suggested for use on work tables to permit smooth sliding of parts being drilled, sanded. It is also applicable for guard rails of conveyor bends to protect both the guard and the product conveyed. Since

Master
PADLOCKS
for industrial protection!

Famous Master Laminated Padlocks
Multiple steel plates . . . stronger than a solid block! Genuine brass-cylinder, pin-tumbler security. No finer padlock protection.

Stainless Steel Combination Padlocks
Double-wall construction . . . 3 number brass locking mechanism. Available with "Key-Control" — one control key opens all locks.

Special Long or Short Shackles
For switch boxes, chains, truck or freight car doors, and other uses where special shackle lengths are more desirable.

Speedy Service on Keyed-Alike and Master-Keyed Sets
Master's Service Department is geared for fast delivery . . . in emergencies, special orders are on the way within hours!

FREE BROCHURE
Condensed, easy to use information on the Master padlocks most widely used for industrial applications. Write today.

Master Padlocks
EVERY ONE AN OUTSTANDING VALUE

Master Lock Company, Milwaukee 45, Wis.
World's Largest Padlock Manufacturers

For more facts circle 648 on Reply Card

WANT TO TURN MAINTENANCE DOLLARS INTO PROFIT DOLLARS?

Tom Robertshaw can show you how. Tom's a paint expert—one of a growing force of specialists that constitutes Du Pont's Technical Service Group. His mission: to help you pare down the high cost of maintenance painting. As he sees it:

"Every maintenance dollar you save is a profit dollar. Of course, to insure maximum return on your investment, you've got to begin with quality paint. Too many maintenance men have learned the costly lesson that price-per-gallon as a measure of economy can be mighty misleading. When you specify Du Pont, you're getting the best paint available, backed up by proven performance in the field.

"However, that's only half the story. To bring down the cost of protecting your equipment—and keep it down—the right paint *system* is vitally important. Here's where Du Pont technical competence really pays off. We see to it that the system you employ is specifically suited to your needs. Our recommendations, based on a thorough study of your particular problem, cover everything from surface preparation and paint selection to the most efficient methods of application. We'll show you, too, how to use color effectively to improve plant appearance and promote safety. It adds up to this: lasting protection and longer service life *at lowest cost per square foot per year.*"

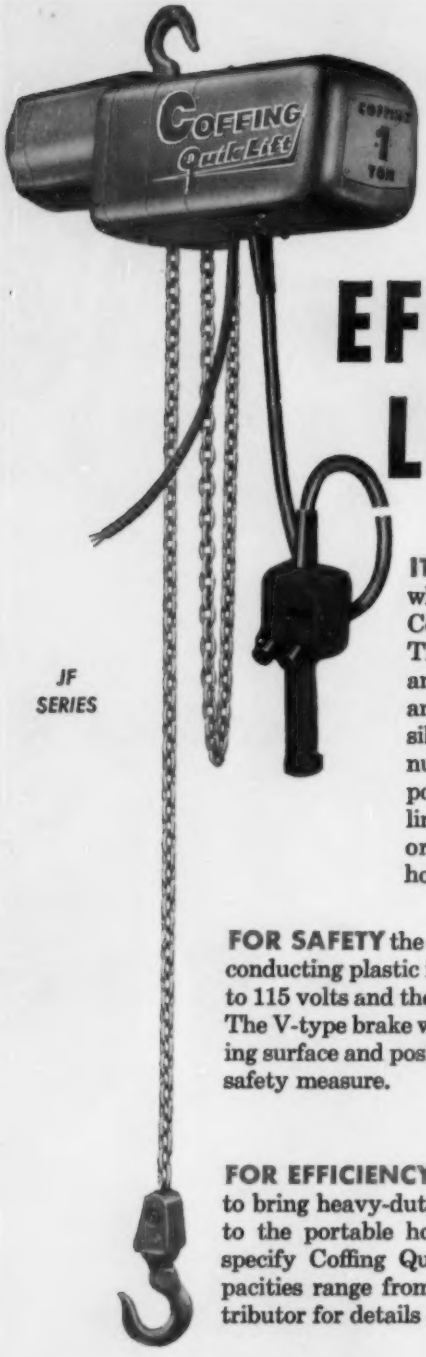
There are men like Tom Robertshaw working out of Du Pont district sales offices from coast to coast. Why not let one of them put his training and experience to work for *you?* Call the office nearest you, or write: E. I. du Pont de Nemours & Co. (Inc.), Finishes Division, Dept. PE-65, Wilmington 98, Delaware.

* * *

Thomas J. Robertshaw began his career with Du Pont in 1938. Following wartime Navy service as an Aircraft Finishes Specialist, he returned as Assistant to the Sales Technical Advisor in Philadelphia. In 1952 he was made responsible for Maintenance Sales in New England and upstate New York. Since 1957, he has been Central District Manager, Industrial Maintenance Sales. Among the industries for which he has solved maintenance painting problems: marine, automotive, chemical, steel, petroleum and food.

DU PONT PAINTS

BETTER THINGS FOR BETTER LIVING . . . *THROUGH CHEMISTRY*



JF SERIES

EASY SAFE EFFICIENT LIFTING!

IT'S EASY to raise or lower loads while pulling a trolley mounted Coffing Quik-Lift Electric Hoist. The pistol-grip control station and the combination strain cable and control cord makes this possible. The light but strong aluminum housing provides ease of portability. Changing voltages, limit switch, type of suspension or chain is quick because the housing is in sections.

FOR SAFETY the control station is made of non-conducting plastic in which the voltage is reduced to 115 volts and the push-buttons are interlocked. The V-type brake which provides maximum braking surface and positive control of loads is another safety measure.

FOR EFFICIENCY this hoist has been designed to bring heavy-duty performance plus durability to the portable hoist field. It will pay you to specify Coffing Quik-Lift. Twenty models—capacities range from ¼ to 2 tons. Ask your distributor for details or write for Bulletin ADH-65.

COFFING HOISTS

DUFF-NORTON COMPANY

826 Walter Street • Danville, Illinois

COFFING HOISTS
Ratchet Lever • Air
Hand Chain • Electric

DUFF-NORTON

DUFF-NORTON JACKS
Ratchet • Screw
Hydraulic • Worm Gear

For more facts circle 650 on Reply Card

NEW PRODUCTS

(Begins on page 216)

it is self-lubricating, Nyl-O-Tape minimizes friction and friction-wear, says manufacturer, and it adheres to metal, wood, plastic and other surfaces. To use it, you simply remove the paper backing and press the tape in place. Hardware Designers, Inc.

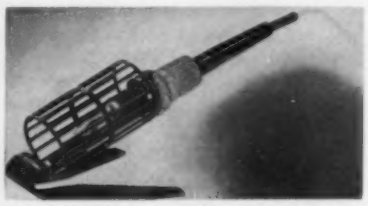
70—ROOF VENTILATORS are multi-use units

Low silhouette roof ventilators in the Transaire series offer multiple applications, such as relief, gravity intake, power exhaust and power supply.

Powered units come in belt-driven or direct drive. A major feature of the line is standardized housing designed to provide continuity and attractiveness of roof appearance, although each unit may be performing a different function. Western Engineering & Mfg. Co.

71—IRON HOLDER makes soldering operations safer

Due to its safety guard design, this soldering iron holder serves to protect the operator against "hot tip" burns,

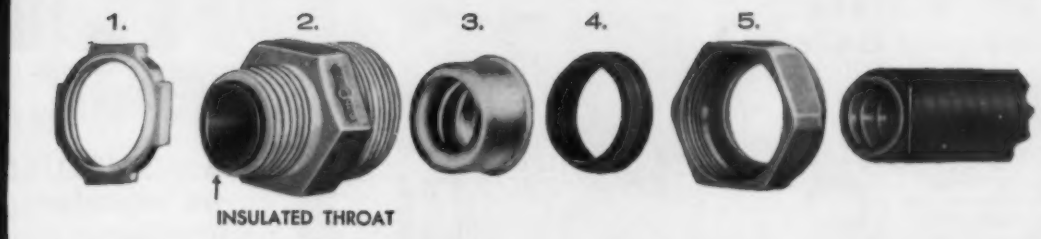


and to protect the iron itself against breakage. It may be attached to the top or underside of the bench, or to a wall or side of the bench, and the operator can adjust the angle of the holder so that the iron is positioned for use. Ungar Electric Tools, Inc.

72—SIGNAL CONVERTER extracts square root

Pneumatic Signal Converter, Model 850, is designed mainly to convert transmitted signals from square root flowmeters into linear signals. This permits use of receivers with evenly graduated charts or linear ratioing controllers. Said to have innumerable

Gedney insulated throat for top protection, easier pull-through



Now you can order Gedney Liquid-Tite Connectors with the added protection of insulated throats. You get faster, easier pull-through . . . eliminate dangerous wire fraying. Gedney Liquid-Tite Connectors are the finest, most efficient connectors available for use with liquid-tite conduits. They're precision-made from top grade malleable iron . . . designed to give lifetime dependable service in oil- and water-tight flexible raceways.

Gedney Liquid-Tite Connectors are supplied in standard sizes from ⅜" to 2" . . . straight, 45° or 90° . . . with or without insulated throats. Be sure . . . specify Gedney.

As shown from left to right in illustration, Gedney Liquid-Tite Connectors consist of:

1. Locknut — nut stock steel — cadmium-plated.
2. Main fitting — straight, 45° or 90° angle — malleable iron — cadmium-plated. Insulated throat — optional.
3. Grounding brass bushing — 1 piece — threaded to engage spiral of all type conduits.
4. Molded Vinylite sealing ring — pliable — ever-lasting.
5. Gland nut — malleable iron — cadmium-plated.

GEDNEY FITTINGS FIT

GEDNEY
ELECTRIC COMPANY
GEDNEY
AMERICAS BLDG. • RADIO CITY • NEW YORK 20
Foundry, Factory and Shipping Point, Terryville, Conn.

For more facts circle 651 on Reply Card

The Company that cares enough to give you the best!

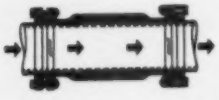
Massco-Grigsby

PINCH VALVES

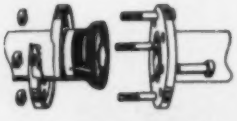
RUBBER, NEOPRENE for Corrosion and Abrasion

- 1" to 14" inside diameter.
- Pressures to 150 psi.
- Temperatures to 200° F.
- Patented "hinged" sleeve. Recesses serve as "hinges" during compression; reduce strain and permit tight closing.

- Cannot leak or stick.
- No working parts in contact with pulp or liquid; no packing glands.



- Unobstructed flow eliminates high friction loss.
- Remote control available.
- Can be equipped for automatic regulation.



- Split flanges and patented Flex Seal ends assure perfect seal.
- Closing mechanisms... manual handwheel; handwheel with chain and sprocket reduction unit; electric worm gear motor reducer; chain operated torque arm reducer; hydraulic; air-hydraulic.

WRITE FOR NEW CATALOG...

Manufacturing Division

MINE AND SMELTER SUPPLY CO.

3880 RACE STREET • DENVER, COLORADO
OFFICES AND AGENTS IN PRINCIPAL CITIES

For more facts circle 652 on Reply Card

NEW PRODUCTS

(Begins on page 216)

applications in addition to its use as a square root extracting relay, it can be used to convert any pneumatic signal into a corresponding output signal of different characterization. Design Specification Sheet DS 850 gives details. Brooks Rotameter Co.

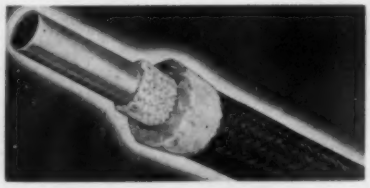
73—STORAGE RACK holds extra long items

For storing tubes, rods and other long pieces, this rack is available in a wide range of dimensions. It is constructed of standard steel parts and is available in either angle-type shelving, which is

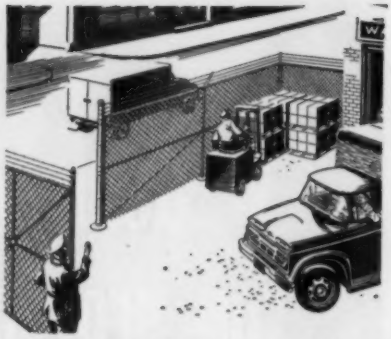
bolted together, or T-line shelving, which uses quick-fastening channel clips instead of nuts and bolts. The easily assembled racks come in gray or green baked enamel finish. Penco Div., Alan Wood Steel Co.

74—SLIP-ON COVERING is flexible piping insulation

Unarco Insutube is a lightweight noncombustible flexible tubing for temperatures from 50 to 500 F, for insulating bent piping or tubing where rigid material would be impractical. It is also suggested for insulating flexible connecting lines and for con-



ditions of severe vibration. The product consists of three basic parts: a braided asbestos inner tubing; a lightweight fibrous-glass insulation; and an outer covering jacket of braided asbestos tubing. Insutube is available with an uncoated outer jacket, or with outer jacket coated with oil and abrasion resistant, self-extinguishing syn-



About that property of yours...

PAGE FENCE

These 3 VALUES are important

1. QUALITY is important. When you invest in a fence you want it to last for a long, long time. When you specify PAGE you get 77 years of our experience in the design and manufacture of a quality fence. Page Fence is engineered for long-lasting service and is covered by a Registered Certificate of Quality.

2. WIDE CHOICE is important. For example, we offer a choice of 4 chain link fabrics—ACCO-Aluminized, our latest development, or galvanized steel, stainless, or solid aluminum. Each of these has characteristics which meet individual preferences or make it more suitable to meet certain climatic or service conditions. Furthermore, there are 8 basic fence designs and 6 gate styles. No other company can serve you with so wide a selection.

3. INSTALLATION is important, too. A fence can be no better than the quality of its erection. The Page Fence Member in your locality is trained, experienced, responsible, and interested in your satisfaction.

• • •

When you write us, we'll send you the whole story in a helpful booklet, and the name of our nearest Member. Call him, he will gladly suggest the best answer to your property protection problem.

Helpful booklet describes fence styles, gates and, components

PAGE FENCE ASSOCIATION
National Headquarters • Monessen, Pa.
A product of Page Steel & Wire Division
American Chain & Cable Co., Inc.

For more facts circle 653 on Reply Card

Wissco Belts convey as many as 500,000 powdered metal parts of all shapes and sizes daily through 2000° sintering furnaces at American Powdered Metals. Here, automotive parts are entering one of the furnaces.

This is the image of CF&I. He represents years of steel-making experience that assures dependable products like Wissco Belts. He also represents CF&I's engineering assistance in the design and selection of the proper belt for your operation.

FAMOUS NAMES
ride on WISSCO BELTS
American Powdered Metals Inc.

"Wissco Belts are ideal for our operation", says Mr. Lavern Struble, Plant Superintendent at American Powdered Metals Inc., North Haven, Conn. "We've used them for years and I don't see how any other belt could improve on their performance. They are easy to install, have a remarkable service life, and require virtually no maintenance.

"We use special alloy Wissco Belts in our plant operations. They're in service twenty-four hours a day, six days a week, conveying powdered metal parts from the dies through 2050°F. sintering furnaces", Mr. Struble continues. "These belts are essential for the efficient operations needed to maintain our production schedules."

Experience like Mr. Strubel's has proved the quality of Wissco Woven Wire Belts. They are available in plain, tinned, galvanized, stainless or special steel. Wissco's open mesh construction allows uniform circulation of air and rapid drainage. High temperature belts, like those at American Powdered Metals, are made of special alloys that resist heat, corrosion and abrasion. They also have a straight rod reinforced construction for maximum strength. Wissco belts are usually shipped on reels for fast and simple installation.

Wissco Engineers will gladly cooperate with you on any conveying or processing problem. To get expert advice, call the nearest CF&I sales office.

WISSCO BELTS
THE COLORADO FUEL AND IRON CORPORATION

CF&I STEEL

In the West: THE COLORADO FUEL AND IRON CORPORATION
Denver and Oakland
In the East: WICKWIRE SPENCER STEEL DIVISION—Atlanta • Boston • Buffalo
Chicago • Detroit • New Orleans • New York • Philadelphia
CF&I OFFICE IN CANADA: Montreal

7284

For more facts circle 654 on Reply Card

For more facts circle 655 on Reply Card

NEW PRODUCTS

(Begins on page 216)

thetic rubber. A heat-sealed plastic liner vapor barrier inserted between outer jacket and fibrous glass insulating medium is available. Manufacturer recommends Insutube for applications requiring low conductivity, light weight, flexibility and fire safety. Tubes are ½ in. thick, available in ¼- to 2-in. sizes. Fibrous Products Div., Union Asbestos & Rubber Co.

75—TEMPLATE for drawing metal retained seals

This drafting template, for making cross sections of company's metal retained seals, is pocket size and made

of semi-opaque, non-glare plastic. Cut outs for pencil points duplicate the cross section pattern of Gask-O-Seals in twice and four times size for four styles. Actual size is printed in black above each style, and can be traced. The template includes dimensional tolerance and technical information. It is available free to qualified plant engineers. Parker Seal Co.

76—LOCK prevents tampering with power tools

Power-Blok can be slipped onto the prongs of a power cord and locked in place with a key—preventing the cord

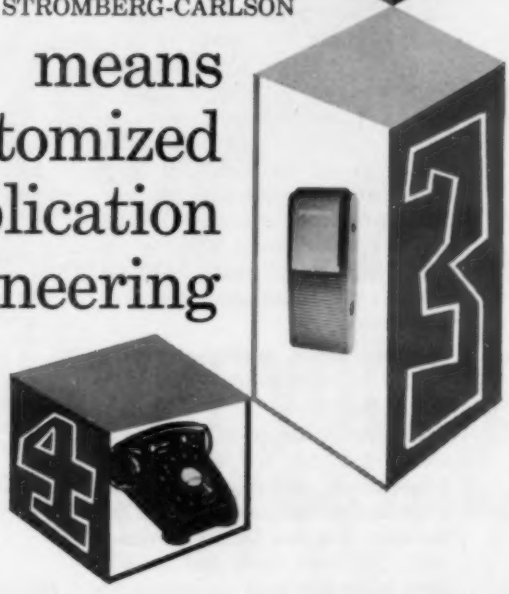
from being used. It locks either two- or three-pronged cords. Power-Blok is intended to prevent unauthorized use of electric power saws, lathes and other tools. (In the home, it can be used to keep children from plugging in appliances, Hi-Fi sets etc.) Hurd Lock & Mfg. Co.

For more facts circle 654 on Reply Card

ONE OF THESE SYSTEMS (OR A COMBINATION) MAY BE EXACTLY WHAT YOU NEED:
1. Typical "customized" paging or background music system—one of many possible arrangements of standardized components. **2.** "Key-municator"* loudspeaking intercom system is another Stromberg-Carlson aid to efficient operation. **3.** A Pagemaster® selective wireless paging system may best meet the requirements of your operation. **4.** A flexible, expandable Dial-X® private telephone intercom system can be tied to a paging system or used independently. *Trademark

COMMUNICATIONS BY STROMBERG-CARLSON

means customized application engineering



The communication needs of your plant are very special. No existing "packaged" system meets your specific needs.

How do you get a made-to-order system at a ready-made price—a system without installation and maintenance complications?

The answer: Stromberg-Carlson's concept of customized application engineering using STANDARDIZED components.

We have the basic building blocks. We can assemble them for your specific application, and provide a system that installs easily, insures against obsolescence, gives you top reliability with minimum maintenance and service.

The authorized Stromberg-Carlson distributor in your area is a qualified communication consultant. Let him study your operation, pinpoint your needs, and show you how Stromberg-Carlson can meet them.

Look in the Yellow Pages under "Public Address & Sound Equipment," or write to Commercial Products Division, 1415-05 North Goodman Street, Rochester 3, New York.

"There is nothing finer than a Stromberg-Carlson"

STROMBERG-CARLSON
A DIVISION OF **GENERAL DYNAMICS CORPORATION**

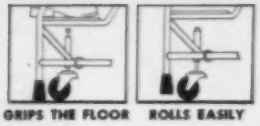
For more facts circle 656 on Reply Card

GO UP WITH CONFIDENCE ON

BALLYMORE

Safety-Step

LADDERS



GRIPS THE FLOOR ROLLS EASILY

Now . . . Ballymore combines welded steel or aluminum safety treads with wide-base pyramid design to offer extra safety and stability. Ballymore ladders let you climb quickly . . . and with confidence—any required height up to 15 feet. Spring-mounted casters that retract when you step on the first step is another safety "plus." They let you roll the ladder easily, yet grip the floor surely to provide safety at all levels.

All welded, corrosion-resistant Ballymore Safety-Step Ladders are available in four types—with 47 models to choose from. Step up to a new standard of safety today.

WITHOUT HANDRAILS

WITH HANDRAILS

For illustrated catalog covering complete line, write to

BALLYMORE COMPANY, WEST CHESTER 29, PA.

BALLYMORE

EQUIPMENT FOR WORKING *Safely* ABOVE FLOOR LEVEL

Call your LOCAL DISTRIBUTOR

For more facts circle 657 on Reply Card

"Doughnut" Tunnels

(Continued from page 135)

plenum chambers and the 9-in. stainless steel exhaust ducting connected to exhaust fans of 600 cfm capacity each. Housed on the same deck—and reached by a grated steel catwalk and ladder system—are the air conditioning reheat coils.

3. Upper Core: This carries tempered air ducting and hot and chilled water supply and return lines for the conditioning system.

"Hot" labs scattered throughout the plant (several are in the Science Building) are girded by 18-in. reinforced concrete walls capped with an 8-in. concrete roof and sealed by a 3-in. thick steel door (three inches of steel have approximately the same radiation protection as 8 in. of concrete).

In some really critical areas, buildings are partitioned by 8-ft thick walls built from hollow, H-shaped (see first illustration) concrete blocks. Into the hollow spaces are inserted either two slabs of concrete or lead pigs of about the same dimension.

"Hot" pipe trenches—running under the building's floor—are walled with 6 in. of concrete, their interiors coated to protect against possible leakage. Furthermore, these trenches are covered with ¼ in. removable steel plates. Conduit trenches are constructed in a similar manner.

Most isotope piping—including runs to the underground water tanks—is aluminum.

Isotopes produced in a 20-ft deep water-filled pit are shuttled, via deep-buried pneumatic tubes of Transite, to an underground test building. The test facility—overlaid with 7½ ft of earth and its 8-in. thick concrete roof supported by 3 ft concrete beams—is sealed by a single, 6-ft thick, 35-ton, rail-mounted door. Pushbutton controlled, this huge closure is self-propelled by rail-riding motors. **End**

Tear Sheets, Anyone?

Readers interested in obtaining tear sheets of articles should write to the Editor, Plant Engineering, 308 East James St., Barrington, Ill., or use the postpaid card elsewhere in this issue.

GOOD REASONS WHY...

FEEDRAIL

Crane and Hoist Electrification

The right choice of an electrical system for cranes and hoists is reflected in increased operating efficiency and lower costs. In addition to unfailing power, you need the safety to equipment and personnel given by steel enclosures. You need compactness and adaptability, a flexibility to meet electrical requirements of tomorrow as well as today. And you need a system low in installation cost, easy to maintain during the life of the crane or hoist.

That's why thousands of companies have selected FEEDRAIL Crane and Hoist Electrification Systems with the movable trolley outlets that travel right along with the crane or hoist.

Why not get the details about FEEDRAIL today?

For safety, adaptability and convenience electrify with...

FEEDRAIL®

TROLLEY BUSWAYS

FEEDRAIL CORPORATION
DEPT. P-5, 125 Barclay St., New York 7, N. Y.
Please send Bulletin No. 76 "Feedrail Crane and Hoist Electrification Systems"

Name_____ Title_____

Firm_____

Address_____

City_____ Zone____ State_____

For more facts circle 658 on Reply Card

try this on your pipe...

(it's Pittsburgh Fiber Glass Pipe Insulation)

Acme Insulation Company, Pittsburgh, did . . . on the piping job at Pittsburgh's new Gateway Parking Garage in Gateway Center. And here's what Acme owner Walter S. Peebles says about this installation:

"We chose Pittsburgh Fiber Glass Insulation for its efficiency, appearance and permanence. It's lightweight, handles easily, cuts readily with a knife, is quickly applied. There's a minimum of waste material.

"We've found that Pittsburgh Pipe Insulation holds its size and shape, does not effect the metal it covers, and has a fine record for low-cost maintenance. We used 8,300 ft of it on ½" to 14" pipe for underground heating, snow melting, chilled water lines, general plumbing, sill cocks and drain lines.

"It's probably the finest insulation that can be used, especially in subsurface locations."

FOR TOP THERMAL CONTROL, THIS IS IT! Pittsburgh Fiber Glass Pipe Insulation is a molded flexible hollow cylinder, slit along its length to provide quick application to pipes or tubing. It has high thermal efficiency for any type pipe insulating job and is surprisingly economical. You can get complete details from your nearest PPG Fiber Glass Sales Office, or by writing to *Pittsburgh Plate Glass Company, Fiber Glass Division, One Gateway Center, Pittsburgh 22, Penna.*

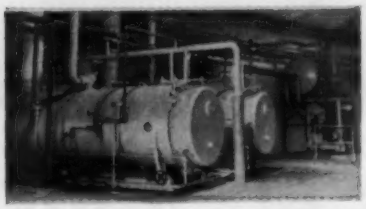
SALES OFFICES: Atlanta, Attleboro, Buffalo, Charlotte, Chicago, Cincinnati, Cleveland, Dallas, Denver, Detroit, Fort Wayne, Houston, Kansas City, Los Angeles, Louisville, Milwaukee, Minneapolis, New Orleans, New York, Philadelphia, Pittsburgh, St. Louis, San Francisco and Washington.

FIBER PPG GLASS PITTSBURGH PLATE GLASS COMPANY

For more facts circle 659 on Reply Card

1st choice for steam in world's largest dome

Matched pair of 200 hp Cleaver-Brooks boilers picked to supply steam for cleaning tank cars and for heating, too, at Union Tank Car's great new repair center in Baton Rouge, Louisiana



This fabulous structure houses the most modern of tank car repair facilities. The two Cleaver-Brooks packaged boilers provide low-cost process steam for cleaning tanks — eliminating residual acids, volatile and tenacious liquids or near-liquids.

Their high-capacity performance not only meets the demands for efficiently produced steam for cleaning (guaranteed 80%), but also provides steam for heating.

Because of packaged design, the two 200-hp units (delivering 150 lbs. pressure) were easy to install, occupy minimum floor space. And the boilers are fired by either oil or gas . . . thus, providing operational flexibility regardless of available supplies.

So far, Union Tank Car has used steam from the Cleaver-Brooks boilers to clean out cars that have transported petroleum products, chemicals, coal tar products, vegetable oils and liquid fertilizers.

The choice of the Cleaver-Brooks boilers was underwritten by their combination of remarkable compactness, automatic operation, wide-range flexibility and around-the-clock reliability.

If you'd like to know more about this installation or how Cleaver-Brooks packaged boilers (15 to 600 HP) fit into your expansion or replacement plans, write Dept. F, 364 E. Keefe Ave., Milwaukee 1, Wisconsin.

Cleaver Brooks®

ORIGINATOR AND LARGEST PRODUCER OF PACKAGED BOILERS

For more facts circle 660 on Reply Card

Corrosion Troubles?

(Continued from page 143)

exit gas reaches its "dew point" before issuing from the stack.

This danger of corrosion from a low dew point is increased by the use of steam jets to increase the draft, and by the cooling effect associated with intermittent operation.

Records of our Engineering Service Department indicate the upper third of the stack—where the low dew point usually occurs—deteriorates faster than the lower two thirds. It is not good practice to renew this upper portion alone, since the lower part frequently does not have a service life to match the replacement.

Most stack materials have limitations — excessive weight, low strength, and inability to withstand temperature changes and physical blows. Wrought iron, however, challenges stack corrosion with marked success in many applications and under various operating conditions.

For example, in 1891 the W. W. Patterson Company erected a 65-ft steel stack—30 in. in diameter from top to bottom. Fabricated of 3/16-in. plate this stack was renewed three times in 28 years. In 1919, wrought iron was used for 100 per cent replacement. Nineteen years later the stack was dismantled, sold to Thornhill Industrial School in Pennsylvania, and is still in use.

To thwart corrosion in these and other applications, and reduce its enormous cost, plant engineers have used almost countless remedies. However, no individual material seems to be a cure-all; although some have a greater ability to resist corrosion attack than others. **End**

"Sprinklers OK in here?"

For more facts circle 661 on Reply Card

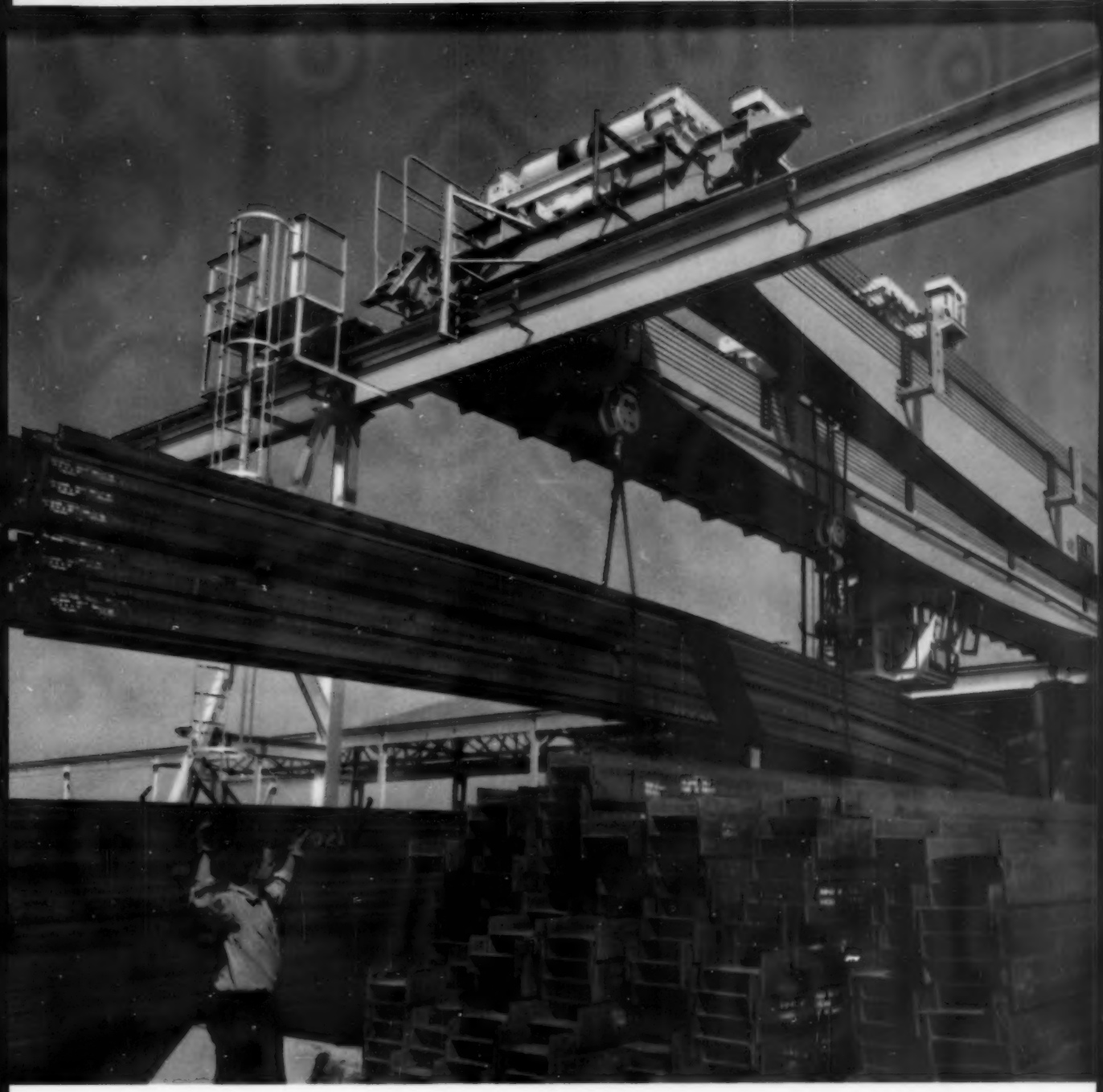


Photo courtesy Pittsburgh-Des Moines Steel Co., Fresno, Calif.

FOR EVERY APPLICATION, THERE'S ONE CRANE OUTSTANDING...

IN STEEL FABRICATING: This double-trolley crane installation is a good example of the way Harnischfeger engineers design a P&H crane for each particular job. With this arrangement, long, awkward beams can be handled quickly, safely . . . without swinging . . . and with accurate control. In addition, the use of two lighter trolleys permits higher travel speeds, thus combining load stability with fast load handling.

Regardless of the material handling problems your plant may have, chances are P&H engineers have successfully solved similar problems. Reason? No other manufacturer has installed as many overhead cranes in as many different applications as Harnischfeger.

If you'd like more information on P&H job-engineered cranes, write for bulletin C-42, Dept. 119, Harnischfeger Corp., Milwaukee 46, Wis.

Cutaway view of P&H electric load brake . . . heart of P&H Magnetorque Control . . . which consists of a simple, indestructible rotor and stationary field through which braking forces are exerted electromagnetically.

P&H
OVERHEAD CRANES

HARNISCHFEGER

Milwaukee 46, Wisconsin

HE'S AN ATLAS WITH HIS RIGHT THUMB!

Every worker is a wonder-man when it comes to lifting, loading, or transporting shapes in this West Coast steel fabricating plant. That's because a P&H Balanced Design Hevi-Lift hoist provides all the muscle . . . and fine control . . . at any time, in any weather.

Balanced Design means matched components of equal high-strength. There are *no* weak parts in this hoist! It's totally enclosed, weatherproof and dustproof for outdoor use . . . never needs greasing . . . never requires brake adjustment . . . won't heat up even under severe duty cycles.

In short, P&H Balanced Design Hevi-Lifts *will stand up longer under heavier duty cycles — with less maintenance — than any other hoist made today!*

Bulletin H55 tells the whole story. Write Dept. 223, Harnischfeger Corp., Milwaukee 46, Wisconsin.

P&H
HEVI-LIFT HOISTS

HARNISCHFEGER
Milwaukee 46, Wisconsin

Photo courtesy Pittsburgh-Des Moines Steel Co., Fresno, Calif.

If you'd like more information on P&H job-engineered cranes, write for bulletin C-42, Dept. 119, Harnischfeger Corp., Milwaukee 46, Wis.

Selecting Filter Media

(Continued from page 151)

upon a large percentage (95 to 100 per cent) removal of a given particle size distribution.

For example, if a porous metal filter was tested for performance with known glass beads ranging from 10 to 30 microns and no bead larger than 22 microns was found downstream and if 96 per cent by weight of the glass beads in this range were retained by the porous specimen, then it would be rated as: 22 micron absolute and 10 micron average pore size.

Both Glass Bead testing and Bubble Pressure testing are used to determine the pore size characteristics of porous media. The first, glass bead testing, involves the introduction of glass beads in known quantity, size and distribution flowed through the porous medium sample and the filtrate then passes through an absolute media such as millipore paper to retain all the beads which escaped the test specimen. This absolute medium is then scanned and with the aid of a photo microscope, the particles are identified, sized and counted.

The Bubble Pressure test is based upon a relationship:

$$R = KS/P$$

Where R is the radius of the pore
S is the surface tension of the liquid
P is the pressure necessary to force air bubbles through a test section of the porous metal
and K is a constant depending on the units used to measure S and P

The method involves the determination of the pressure necessary to force out of the filter pores a liquid which wets it completely. This pressure, called the bubble pressure, is determined by the shape of the hole, its size and the surface tension of the liquid.

The bubble pressure test method has excellent correlation with glass bead test methods, especially in a liquid system such as shown by the data in the table for the hydraulic system filter. The table also shows the comparison of bubble test data and actual performance results for two other media. The porous metal

Equipto modern-flow Benches can easily be arranged into one continuous streamlined assembly which gives you custom designed features at assembly line prices. Available with many types and styles of drawers, drawer pedestals, cabinet pedestals, sliding doors, aerial shelves and a choice of 12 ga. steel, masonite, laminated maple or bonded wood tops in various lengths.

Equipto Bench drawer and door fronts are rounded top and bottom and have individual latch and padlock hasp with provision for number plate and key or combination lock. All drawers ride quietly on trouble-free nylon rollers. Pilfer-proof... contents cannot be reached by removing drawer above.

Now is the time to design that bench set-up you have been thinking about. Write today for big 16 page catalog No. 204 showing all 264 models.

Equipto
744 Prairie Avenue
Aurora, Illinois

For more facts circle 662 on Reply Card

TEST MACHINE at a metal fabrication plant

THERE'S A

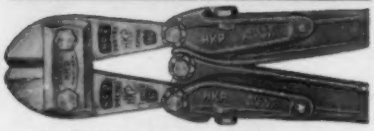
The PORTER CENTER-CUT CUTTER — In 6 sizes, for cutting up to ¾". Our most popular tool. Ideal for general free cutting of soft and medium hard steel. Other models for HARDER METALS.

HKP

PORTER CUTTER

The PORTER WORK-STATION CUTTER — In 3 sizes, up to ½" capacity. For continuous cutting operations it can increase the metal-cutting capacities of one man up to 300%! Saves time, work, money! Leaves one hand free to feed or hold material.

FOR EVERY



The PORTER HEAVY DUTY CUTTER — In 3 sizes, up to ¾" capacity. Specially designed for those rugged jobs in steel mills, construction companies and other heavy industries!

METAL CUTTING JOB

SAVE TIME AND MONEY!
Over 100 Cutters in Various Sizes and Types — Hand or Power Operated

Contact your Industrial Distributor or write direct for your FREE CATALOG!

CUT — up to ¾" rods with HAND OPERATED TOOLS up to 1⅜" rods and 2½" power cable with POWER OPERATED TOOLS.

H. K. PORTER, inc.
Somerville 43, Mass.

For more facts circle 663 on Reply Card

and resin impregnated cellulosic media were tested for use as gas filters and in this case, the velocity of gas, density of the test dust, etc., are also important.

For example, in the case of the porous metal, the bubble pressure test showed a single hole 94 microns in diameter as being the maximum pore opening and yet when the medium was actually evaluated, only a few particles 42 microns in size were noticed downstream on the absolute filter.

Here, is a case of the larger particles dropping out of the gas stream because of velocity and gravity effects and also, the probability of a larger particle impinging on the exact loci of the maximum pore opening. (This latter point applies to any fluid system under maximum pore test).

The lox plant process air filter shows about the same results as the porous metal for the chemical process gas filter. Here again, a gas system performance test resulted in the largest particle passed being 29 microns and yet, the bubble test clearly showed that there was a 40 micron pore in the medium.

It should be pointed out that the Bubble Pressure Test method can be successfully used as a guide in determining the pore size charactertistics of a given porous medium.

Filter media and filter design are no different than a chemical process or a jet aircraft or nuclear power plant from a development standpoint. The search for new materials continues and the old ones are constantly being improved. Most important, they must keep in step. **End**

"Mertz . . . here's the safety award you helped to . . ."

When you BUY a Carbide Core Drill *INSIST* on—

Cyclo-Core®
MULTI-TIPPED CARBIDE ROTARY
DRILL

for drilling
HARD CONCRETE
OR ANY MASONRY

THE Fastest
up to 3 to 1 times FASTER than other core drills

Free cutting design permits faster, easier drilling. Multi-spiral flutes assure positive dust removal from the cutting zone. Cyclo-Core Multi-Tipped Carbide Bits last longer — are easier to resharpen — you can do it yourself! Sizes from ¼" to 6" in diameter. Extra lengths up to 36".

When starting holes, stop "walking" and get accurate hole location with the *EXCLUSIVE* New England Carbide removable "STARTING CENTERS."

New England
CARBIDE-TIPPED
MASONRY DRILL

NEW ENGLAND CARBIDE

DESIGNED, ENGINEERED and PROVEN for the Job! Copied but NEVER equalled!

For Rotary Drilling of ORDINARY MASONRY use CYCLO-TWIST
The most efficient, single point drill available. Sizes 7/64" to 1½" diameter.

For ONE-MAN DRILLING of ANY MASONRY from Brick to Granite use THUNDER-TWIST HAMMER DRILLS
Sizes 3/16" to 1½" diameter

Available at your Industrial Supplier or write direct for information

New England
CARBIDE TOOL CO., INC.
558 Commercial St.
Medford 55, Mass.

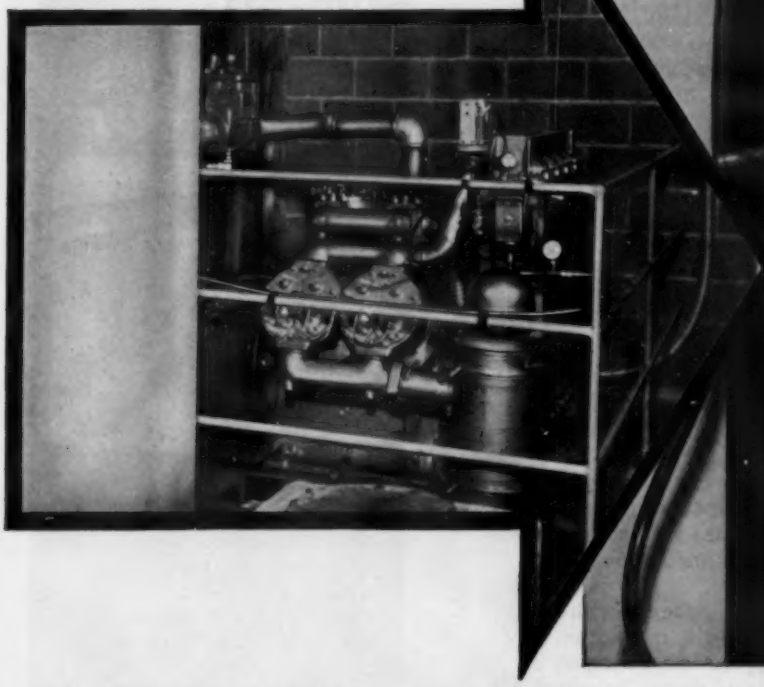
Please send me FREE copy of the "MASONRY BIT SELECTOR GUIDE".

NAME _____
ADDRESS _____
CITY _____ STATE _____

For more facts circle 664 on Reply Card

TEST MACHINE at a metal fabrication plant gets air from the Le Roi 100S2 shown below. Unit also supplies air for presses, automatic and manual welders, painting machines, and automatic assembly machines.

puts your plant air supply right where you need it!



LE ROI 100-HP STATIONARY COMPRESSOR

Trouble-free air-cooled LeRoi 100S2 delivers 450 cfm of air at 125 psi — yet takes up only 20 sq. ft. of floor space.

Any way you look at it, the Le Roi 100S2 two-stage stationary compressor is your best bet to lower your cost of compressed air.

It provides cool, clean airpower. And its compactness permits installation *near the point of use,* thus eliminating excess piping and costly waste of air. If you need more air, you just install more Le Roi S2 compressors — and you can still beat the cost of centralized air systems.

The electric-motor-driven 100S2 is easy to operate and maintain. Its Dual-Control permits either constant-speed or automatic start-and-stop operation. Air cooling eliminates plumbing and water line freeze-ups . . . permits indoor or outdoor installation. Balanced design reduces vibration and noise . . . extends compressor and motor life.

Put your compressed air system on a paying basis. Investigate the complete Le Roi line of unit-type and stationary air compressors — from ½ to 100 hp. Contact your Le Roi distributor, or write to Le Roi Division, Westinghouse Air Brake Co., Milwaukee 1, Wisconsin. sc-65

LE ROI STATIONARY COMPRESSORS

PORTABLE AND TRACTAIR® AIR COMPRESSORS • STATIONARY AIR COMPRESSORS • AIR TOOLS

For more facts circle 665 on Reply Card

New Way to Stop Faucet Leaks!

★ 9-in-10 washers are fastened with TOO LONG or SHORT SCREWS thus loosen and destroy themselves. Leaks quickly follow!

34 YEARS OF RESEARCH REVEALS NEW SOLUTION

★ New, patented 'Sexauer' SELF-LOCK screws have imbedded expanding NYLON PLUG. They lock at required depth AUTOMATICALLY, hold washers firmly! Made of MONEL, they are rustproof, non-corroding. Heads can't twist off. Screw slots can't distort.

★ NEW, improved 'Sexauer' EASY-TITE faucet washers are made of super-tough, pliable du Pont compound (not rubber or fibre). Reinforced, like a tire, with a vulcanized layer of Fiberglas, they resist distortion and splitting from shut-off grind and squeeze.

★ Faucet leaks repaired with 'Sexauer' EASY-TITE washers and SELF-LOCK screws outlast ordinary repairs "6-to-1"!

HIDDEN COSTS OF FAUCET LEAKS!

Hackensack, N.J. Water Co. and American Gas Association figures prove stopping just ONE PIN-HOLE SIZE (1/32") LEAK saves you 8,000 gal. water quarterly. A HOT WATER FAUCET LEAK repair saves you over $7.58 QUARTERLY in fuel and water bills. Fewer leaks also produce important savings on MATERIALS, LABOR and COSTLY FIXTURE REPLACEMENTS!

A 'Sexauer' Technician will make available our NEW Catalog, Edition "J", listing our entire line of over 3,000 TRIPLE-WEAR plumbing repair parts and tools. He will survey your fixtures, determine the repair parts needed and establish an efficient stock arrangement and control to prevent costly overstocking or shortages. You get this service without obligation. *Act now!*

J. A. Sexauer Mfg. Co., Inc., Dept. S-50
2503-05 Third Ave., New York 51, N.Y.
Please send me a copy of your Catalog "J"

Name _____ Title _____
Organization _____
Bus. Address _____
City _____ Zone _____ State _____

SEXAUER
WORLD'S LEADING SPECIALISTS IN PLUMBING AND HEATING REPAIR PARTS

For more facts circle 666 on Reply Card

Industrial Radio Maintenance

(Continued from page 158)

About 90 per cent of radio equipment troubles are caused by tube defects. Next in line is the vibrator, which has limited life, and requires frequent replacement. It is safer to replace doubtful tubes and vibrators than chance in-service failures.

A new tube, however, may not always be good and therefore all new tubes should be tested before being placed in service. Many new tubes fail during the first 200 hours of use as hidden defects become apparent. When feasible, it is a good idea to "age" tubes before using them. This can be done by building a rack containing tube sockets with filament connections connected to a power source of correct voltage. New tubes are placed in the sockets and allowed to operate for 200 hours or more before use. While it would be even better to provide plate, screen and grid voltages, a tube ager of this type becomes rather complex and its cost is seldom warranted.

If a receiver fails the sensitivity test, realignment of the tuning adjustments may restore performance. The alignment procedures are outlined in the applicable service manual. When this does not do the trick, new tubes should be tried, one at a time, retrimming the tuning circuits associated with each tube, checking for any improvement. Even if a tube tests OK, it may not function correctly in some circuits.

When a transmitter fails to deliver its rated output, the tuning circuits should be adjusted as outlined in the service manual. New tubes should be tried, one at a time, noting any increase in output as indicated by an RF wattmeter connected to the transmitter's antenna connector.

After servicing, a radio unit should be wrapped in paper to prevent dust accumulation, if it is not to be placed into service immediately. Each unit must have affixed to it a card furnished by the FCC which verifies that it is a licensed radio station. Entries should be made in the system log noting extent of repairs and the date when they were made.

On a vehicle, the antenna, control head, loudspeaker and microphone as well as the vehicle's elec-

VALUE ENGINEERING PROVES

ROCKWELL *Resilient-Seated* Butterfly Valves *STAND OUT*

- Weigh Less—Cost Less
- Need Less Space
- Easier to Install
- Always Operable
- Low Pressure Drop
- No Fouling
- Negligible Maintenance
- Simplified Control —Manual or Remote

Bodies lined with any elastomer—from natural rubber to Viton.
Construction of any metal.
Operates from simple lever to automatic and remote control. No limit in size.
Let Bulletin 590X help you put value engineering to work on your valve applications. Just mail the coupon below.

W. S. ROCKWELL COMPANY
2920 Eliot St., Fairfield, Conn.

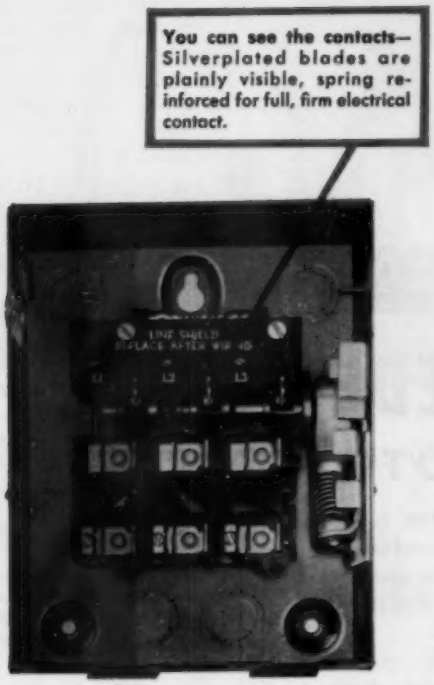
Send me Bulletin 590X.

Name .....
Title .....
Firm .....
Address .....
City ..... State .....

For more facts circle 667 on Reply Card

For extra safety...

GET THE SWITCH WITH THE RED HANDLE!



No wire abrasion
Side wiring gutter is unobstructed—free of moving parts which can chafe and wear wire insulation.

These features mean extra safety for you: Vivid red handle is insulated, provides ON-OFF identification from over 100 feet away; safety phase barrier protects against accidental contact with live parts; no fiber linkages in mechanism to deteriorate with age, moisture or heat; complete locking provision; mechanical interlock and line shield (Heavy Duty). Heavy Duty (Type A) sell at Normal Duty (Type C) price levels. Write for Bulletin CPD-74. See your G-E distributor for a demonstration.

GENERAL ELECTRIC

Circuit Protective Devices Dept., Plainville, Conn.
For more facts circle 668 on Reply Card

SEE a demonstration by a specialist

REMOVING SLIPPERINESS FROM FLOORS

for FREE demonstration or literature address:
WEST CHEMICAL PRODUCTS INC., 42-20 West St., Long Island City 1, N. Y.
Branches in principal cities • IN CANADA: 5621-23 Casgrain Ave., Montreal

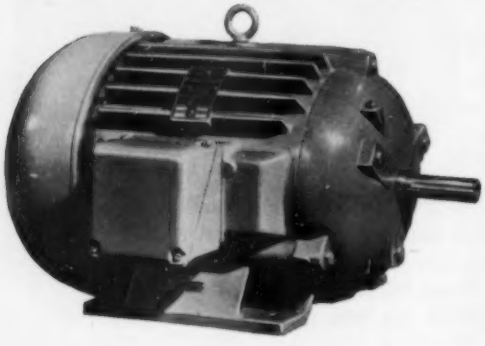
WEST

For more facts circle 669 on Reply Card

NO UMBRELLA NEEDED

for this BROOK TEFC MOTOR!

This BROOK A.C. TOTALLY ENCLOSED, FAN COOLED MOTOR is in a "cocoon" that keeps out moisture, fumes and dust. Heat is dissipated through large radial heat exchanger fins. They are cutting costs in juice extraction plants, canneries, dairies, breweries and many indoor and outdoor uses where moist atmospheres or wet weather may be a problem.



Available in new N.E.M.A. rerate frames that take less space and weigh 12-15% less, 1 to 40 HP, or in the old larger frames, 1 to 600 HP. Warehouses, Sales Representatives and Dealers throughout the country. Send for literature on the complete line of Brook Motors.

"World's Most Respected Motor"

BROOK MOTOR CORPORATION

3302-04 W. Peterson Ave., Chicago 45, Illinois

In Canada: BROOK ELECTRIC MOTORS OF CANADA, LTD.
250 University Ave., Toronto, Ontario

SINCE 1904
BROOK ELECTRIC MOTORS

For more facts circle 670 on Reply Card

tric power supply, are a part of the system but are not generally serviced in the radio shop. No license is required to service these appurtenances.

To determine if the antenna system is functioning, a simple field strength test may be made. A device such as the Heath PM-1, available only in kit form, may be used for rough measurement of transmitted power. Its meter indicates the strength of the radio signal in the proximity of the mobile unit. If no signal is indicated, but the transmitter works in the shop, check the antenna and its coaxial cable.

It is feasible for a plant to handle radio maintenance internally when there is a sufficient amount of radio equipment to offset the investment in test equipment and labor cost or when other electronic equipment is also to be maintained. Otherwise, it is more economical, but not as convenient, to farm out radio maintenance work. In favor of do-it-yourself is the inevitable expansion in the use of other electronic equipment which also requires maintenance. Therefore, by setting up electronics maintenance facilities now and by starting an in-plant electronics training program as soon as possible, the plant maintenance departments will be more ready to assimilate further automation. **End**

Fluid Power Maintenance

Various phases of fluid power maintenance are discussed in this 48-page reprint of a series of articles which have appeared in past issue of Plant Engineering.

The series covers all facets of fluid power maintenance from the installation of hydraulic systems to the maintenance of individual units in a system. Here is a brief listing of some of the 12 articles appearing in this reprint: How To Care for Hydraulic Pumps, How To Maintain Hydraulic Valves, Accumulators and Intensifiers, Maintaining Hydraulic Cylinders, Compressors, Filters and Lubricators, Air Control Valves and Spare Parts.

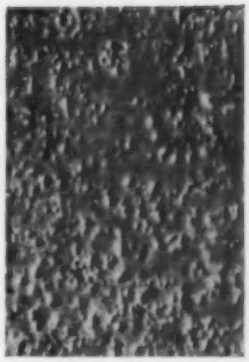
Price for this booklet is 75 cents. If you would like to have a copy of this series for your own file, send your request to the Editor, Plant Engineering, 308 E. James St., Barrington, Ill.

Philadelphia Electric Company workers get sure footing despite oil film with **A.W. ALGRIP**

Hot, heavy oil occasionally spills on this walkway at the Schuylkill Station of the Philadelphia Electric Company, but A. W. ALGRIP helps prevent accidents by providing assured footing.

A. W. ALGRIP rolled steel floor plate is produced by Alan Wood Steel Company by a patented process in which an abrasive—just like the kind used in grinding wheels—is embedded to a controlled depth. It becomes an integral part of a tough steel plate.

A. W. ALGRIP can be used as independent flooring . . . or as flooring overlay, on level or inclined surfaces. Put your plant on a safe footing, with A. W. ALGRIP . . . approved for Safety by Underwriters' Laboratories. Write for Bulletin AL-S4.

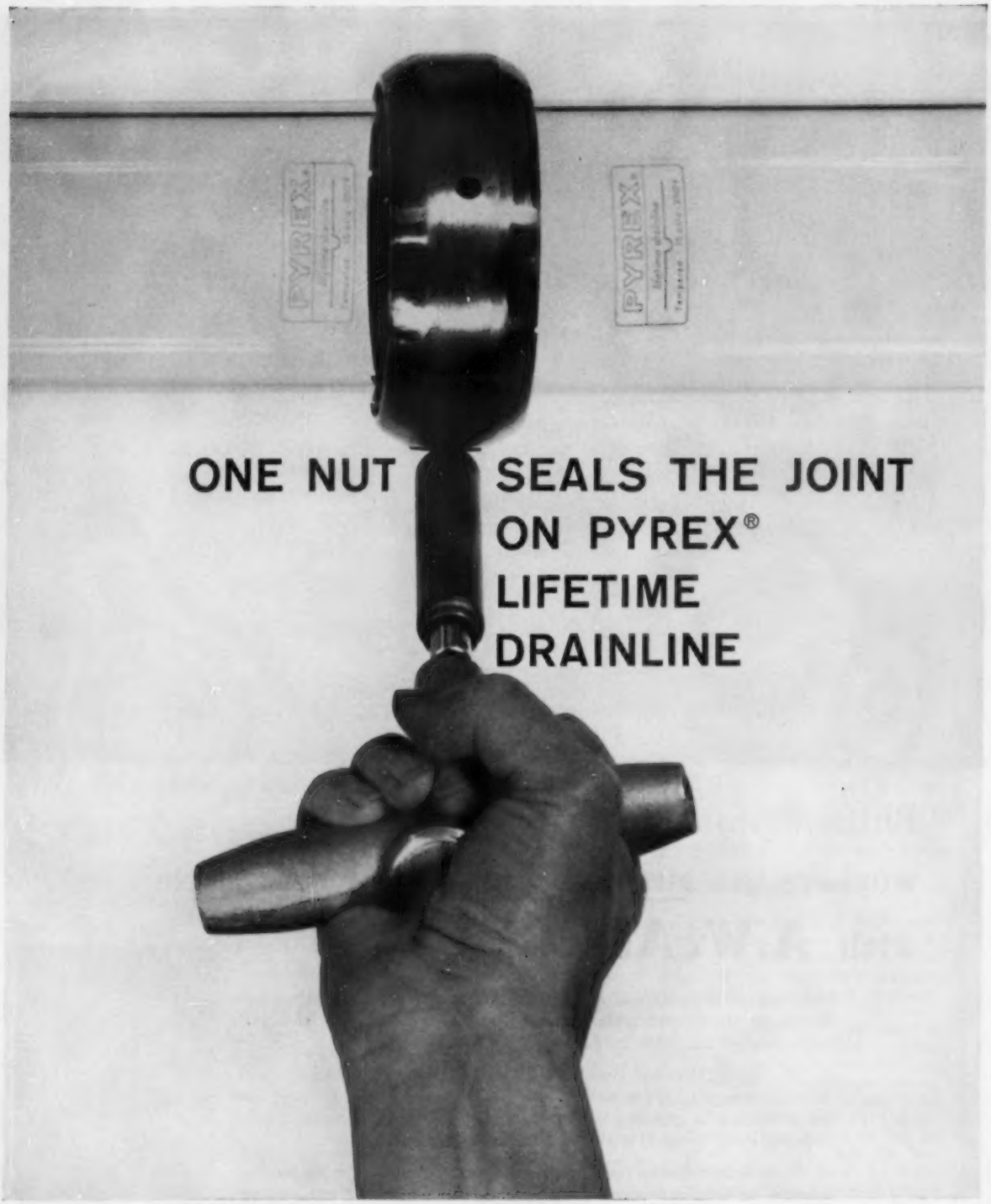


ALAN WOOD STEEL COMPANY

Conshohocken, Pa. • STEEL PRODUCERS WITH SERVICE IN MIND

DISTRICT OFFICES AND REPRESENTATIVES: Philadelphia • New York • Los Angeles • Boston • Atlanta Cincinnati • Cleveland • Detroit • Houston • Pittsburgh • Richmond • St. Paul • San Francisco • Seattle Montreal, Toronto and Vancouver, Canada—A. C. Leslie & Co., Ltd.

For more facts circle 671 on Reply Card



ONE NUT SEALS THE JOINT ON PYREX® LIFETIME DRAINLINE

This simple joint is one of the reasons we can guarantee PYREX laboratory drainline against corrosion and leakage for the life of the building in which it is installed.

Stab this simple coupling with two lengths of PYREX lifetime drainline. Turn the single nut until the torque wrench spins free. You've got a positive, lifetime seal.

Plus: Ten-foot lengths mean fewer joints. Light weight means fewer hangers. One-nut joint means fewer work hours.

SEND FOR NEW BULLETIN which spells out guarantee, explains why PYREX lifetime drainline is the least expensive you can install. Write for PE-30 to Plant Equipment Department, 10 Crystal Street, Corning, N. Y.

CORNING GLASS WORKS

CORNING MEANS RESEARCH IN GLASS

For more facts circle 672 on Reply Card

New Plant Construction

(Continued from page 178)

facilities by at least 50 per cent. The expansion, to cost about $5 million, will provide the company with all the butadiene it requires in its production of synthetic rubber. Construction will begin in about three months and will be completed by about May, 1961. Foster Wheeler Corp., New York, N. Y., will be the engineer and contractor of the project.

Lee's Summit, Mo.—Western Electric Company, 195 Broadway, New York, N. Y., will build its entire plant at once rather than in stages. Construction of the new plant, to cost about $25 million, will begin soon and is scheduled for completion in 1962. New plant will have 1,500,000 sq ft of floor space in three single-story structures—an administration building and two manufacturing buildings.

Neosho, Mo.—Linde Company, Division of Union Carbide Corp., 30 E. 42nd St., New York, N. Y., plans to construct a liquid oxygen-nitrogen plant on large building site here. Plant will have an initial capacity of 135 tons per day. Work on this plant is already under way and will be completed late this year.

Canandaigua, N. Y.—Bird's Eye Division of General Foods Corp., 250 North Ave., White Plains, N. Y., plans to construct a processing and refrigerating plant for producing and storing frozen instant baby food. Construction of the initial 180,000-sq ft plant will begin at once with completion scheduled for the summer of 1961. New plant will represent a capital investment of about $2 million.

Tonawanda, N. Y.—Spaulding Fibre Company, 320 Wheeler St., plans major expansion of company's fabricating facilities located at this city. Plans also include construction of a building to house six new laboratory units. Work on the new construction will get under way soon and will be completed early next year at a cost of $1.25 million.

Plymouth, N. C.—Dixon Chemical and Research Inc., which has headquarters in Bloomfield, N. J., and a sulfuric acid plant in Newark, N. J., announced formation of a new chemical company to build and operate an $8-million corn starch manufacturing plant in this city. Company has joined with Southern Starch Industries Inc., of Plymouth to organize the company to be known as the Dixon Southern Chemicals, Inc. Plans call for the new plant to produce 80,000 tons of industrial corn starch annually. Work on the new plant will begin soon and is expected to go into production the last quarter of 1961.

Lima, O.—Solar Nitrogen Chemical Company plans to expand its local facility here for the production of ammonia, urea, nitric acid and other nitrate facilities. Work on the expansion, reported to cost in excess of $2 million, is already under way and scheduled for completion late this year. When the plant is put in operation it will increase ammonia production to 25,000 tons annually.

Solon, O.—Black & Decker Manufacturing Co., 600 E. Pennsylvania Ave., Towson, Md., has authorized the purchase of a tract of land comprising 14 acres on which it will build a plant for company's air tool subsidiary, Master Power Corp. Contracts in the amount of $700,000 have been awarded for construction of a one-story manufacturing and office building.

Steubenville, O.—Wheeling Steel Corp., Wheeling, W. Va., plans a major improvement program at company's steel works here. Work on the improvement is already under way and is expected to be completed by the early part of next year. One of five blast furnaces will be rebuilt and enlarged and a new turbo-blower installed.

Warren, O.—Republic Steel Corp., Republic Building, Cleveland 1, O., has authorized capital expenditure of

Illustrated—New 9700 Series Piggy Back Hydraulic Control Valve Meets J.I.C. Standards

Look to Logan

the ultimate in hydraulic valve design

FREE SEND FOR THE "LOGAN CALCULATOR"

MEMBER: Nat'l. Mach. Tool Builders' Assn.; Nat'l. Fluid Power Assn.

LOGANSPORT MACHINE CO., INC.
838 CENTER AVENUE, LOGANSPORT, INDIANA

PLEASE SEND COPY OF CATALOG:

- ☐ 100-1 AIR CYLINDERS
- ☐ 100-2 MILL-TYPE AIR CYLS.
- ☐ 100-3 AIR-DRAULIC CYLS.
- ☐ 100-4 AIR VALVES
- ☐ 100-5 LOGANSQUARE CYLINDERS
- ☐ 100-5-1 ULTRAMATION CYLINDERS
- ☐ 51 PRESSES
- ☐ FACTS OF LIFE
- ☐ 61 SURE-FLOW PUMPS
- ☐ 200-1 HYD. POWER UNITS
- ☐ 200-2 ROTOCAST HYD. CYLINDERS
- ☐ 200-3 750 SERIES HYD. CYLINDERS
- ☐ 200-4 and 200-7 HYD. VALVES
- ☐ 200-6 SUPER-MATIC CYLS.
- ☐ 70-1 CHUCKS
- ☐ ABC BOOKLET
- ☐ CIRCUIT RIDER

TO:

NAME _____ TITLE _____

COMPANY _____

ADDRESS _____

How to get drier or cooler AIR or GASES

at low cost

NIAGARA *AERO* AFTER COOLER cools a compressed gas, or air, below the temperature of the surrounding atmosphere, thus preventing the condensation of moisture in your lines. The gas will contain only half of the moisture left in it by conventional methods. Even drier gas can be produced if you require it.

In working with controlled atmospheres of inert gases to prevent undesired reactions, this dryness of the gas at low cost is a great advantage. The cost of the Niagara method is low because it uses evaporative cooling, saving 95% of the cost of cooling water (and its piping and pumping). This direct saving of cost pays for the Niagara cooler in less than two years.

If you use compressed air to operate instruments or pneumatic equipment you will get better results by using the Niagara Aero After Cooler.

Write for Bulletin 130, or ask nearest Niagara Engineer if you have a problem involving the industrial use of air.

NIAGARA BLOWER COMPANY

Dept. PE-5, 405 Lexington Ave., New York 17, N. Y.

Niagara District Engineers in Principal Cities of U. S. and Canada

For more facts circle 674 on Reply Card

for FREE demonstration or literature address:
WEST CHEMICAL PRODUCTS INC., 42-20 West St., Long Island City 1, N. Y.
Branches in principal cities • IN CANADA: 5621-23 Casgrain Ave., Montreal

For more facts circle 675 on Reply Card

more than $159 million for expansion and improvement of company's steelmaking capacity during 1960. Principal projects are installation of hot-strip finishing facilities and a 48-in. continuous heavy gage strip galvanizing line at company's plant located here. Company also plans to install an additional battery of coke ovens and a plastic coating line for steel pipe at its Youngstown, O., plant.

Beaverton, Ore.—Tektronix, Inc., Portland, Ore., plans to construct an assembly plant adjacent to the electronic firm's mechanical fabrication plant located here. Ground will be broken shortly for the two-story concrete and steel building which will be completed before the fourth quarter of this year. New facility will have a floor area of 126,000 sq ft. The plant will represent an investment of $1.4 million.

Kobuta, Pa.—Koppers Company, Koppers Building, Pittsburgh, Pa., plans expansion of facilities for the production of polystyrene plastic at company's Kobuta, Pa., plant located here. Expansion when completed late this year will enable the company to increase its production of polystyrene by about 15 per cent.

Greenwood, S. C.—Parke, Davis Company, Joseph Campau Ave., Detroit, Mich., has authorized the purchase of 100-acres for a new plant for the manufacture of surgical dressings. Work on the new plant will get under way as soon as preliminary engineering work and clearing of the site is completed.

Hohenwald, Tenn.—American Biltrite Rubber Company, Chelsea, Mass., plans to construct a plant for the manufacture of industrial rubber products for its Boston Woven Hose and Rubber Division. Work on the new plant, to occupy about 200,000 sq ft will begin at once and is scheduled to be completed in the fall of next year. Cost of the new facility will involve an expenditure of $3 million.

Baytown, Texas—J. M. Huber Corp., 100 Park Ave., New York 17, N. Y., plans major expansion of company's carbon black facilities at plant located near here. Present capacity of 50 to 60 million lb per year is expected to be doubled. Local facility produces carbon black from heavy residual oil obtained from the Houston area refineries. Work on the additions is already under way and will be completed late next year. Cost of the expansion will run about $2.5 million.

Sweeny, Texas—Phillips Chemical Co., a subsidiary of Phillips Petroleum Co., Bartlesville, Okla., plans to construct another ethylene plant adjacent to its existing plant. The new plant is scheduled to go on stream in the third quarter of 1961. The existing plant will reach an annual operating rate of 290,000,000 lb some time this spring and the new facility will nearly double this capacity.

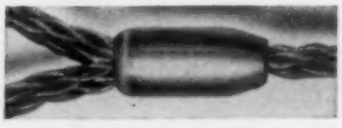
DISTRIBUTORS FILL ORDERS FAST
for Factory-Fitted Tuffy Slings

When time counts, you can count on your Tuffy distributor. Tuffy slings are factory-fitted, factory-packaged and easy to order. They are delivered to you as a complete package — ready to go to work right now.

No complicated specifications in ordering. Tuffys are "tailored" to special uses. Select the sling for the type load you're handling. Just say Tuffy, specify type (U-1, U-2, etc.) and specify diameter and length of fabric wanted.

Why Tuffy Gives You More Service Life Per Dollar

Tuffy's patented 9-part machine-braided fabric combines extra strength and toughness with extra flexibility. Kinks rarely occur. If one does, it's easily smoothed out, leaving sling undamaged.



Tuffy's pressed-on metal ferrule is applied under hydraulic pressure so great that the eye splice has the full strength of the machine-braided fabric. Another Tuffy extra at no extra cost.

Get in Touch with Your Tuffy Distributor

He's set up to serve you fast on every sling need, including the new Union hand-braided slings. And he's backed by his nearby Union Wire Rope depot to assure no time lost in filling orders of unusual nature or quantity.

Tuffy Tips
—on safe use of Slings and Hoist Lines

Safety Council Cites Factors in Lifting Injuries

The National Safety Council reports nearly a fourth of all compensation cases are the result of unsafe handling methods or conditions. The following are listed as factors contributing to handling injuries:

"(a) Handling loads that are too heavy; (b) lifting or lowering with the back muscles instead of the leg muscles; (c) handling load with an insecure grip and failing to watch where hands are placed; (d) handling without sufficient help or failing to use mechanical equipment; (e) handling before getting a firm footing; (f) lifting or lowering with a jerking, twisting movement of the body, or when the body is in an awkward position."

Maintenance Tips for Hoisting Equipment

(1) Be sure crane and hoist controls are in proper working order. Don't use equipment that hasn't been tested recently.

(2) Inspect hitching equipment before it is used. Re-check after use.

(3) Remove hitching equipment not in use from hooks, hoists and loads. Don't allow it to remain loose.

(4) Store slings systematically when they're not in use. Don't let them lie around helter-skelter. They may be damaged between lifts.

FREE!
New Tuffy Sling Handbook

All about slings from A to Z, including types, dimensions and rated loads. Address **Union Wire Rope Corporation, 2272 Manchester Ave., Kansas City 26, Missouri.** Specialists in high carbon wire, wire rope, braided wire fabric, and stress relieved wire and strand.

3

UNION Wire Rope

Subsidiary of ARMCO STEEL CORPORATION

OTHER SUBSIDIARIES AND DIVISIONS: Armco Division • Sheffield Division • The National Supply Company
Armco Drainage & Metal Products, Inc. • The Armco International Corporation • Southwest Steel Products

For more facts circle 676 on Reply Card

NEW BOOKS

for the plant engineer

Economics

ENGINEERING ECONOMY, by E. Paul De Garmo. Published by the Macmillan Company, 60 Fifth Avenue, New York 11, N. Y. Price $8.75.

TODAYS ENGINEER is beset with challenges from many directions and technological advancements beckon for more study. And now, perhaps as never before, his engineering know-how needs to be reinforced by a sound knowledge of economic principles and the ability to support his projects through sound financial analyses. It is advisable that he become more familiar with economic parlance and calculations.

This book primarily meant for college students deals with the subject of engineering economics quite extensively. It could be of value to plant engineers who are concerned a good bit with financial aspects in their plant engineering activities.

Among the chapter topics discussed in this work are the following: depreciation and valuation; relationship of accounting to economy studies; economy studies of new projects; fixed, increment, and sunk costs; replacement studies; capacity, load, and utilization effects; personnel studies.

Plastics Engineering

PLASTICS ENGINEERING HANDBOOK of the Society of the Plastics Industry, Inc. Size 10¼ by 7¼ in.; 565 pp including index; illustrated; cloth bound. Published by Reinhold Publishing Corporation, 430 Park Avenue, New York 22, N. Y. Price $15.00.

WRITTEN FOR the practicing engineer in the plastics industry, this volume is the official handbook of the industry's own Society. As such, it is concerned primarily with the "how to" phases of fabrication of end products from plastic films, foams, powders and sheets.

This is the third edition of the handbook, replacing the edition published in 1954. In the fast-moving plastics industry, six years is a long time, and much of the material presented reflects the advances made.

Chapters on nomenclature and classification of plastics are a welcome reference for those not continually exposed to the terminology of the industry.

Descriptions of procedures for each manufacturing operation are step-by-step; hundreds of illustrations and charts support the process descriptions.

Representative chapter titles from the handbook indicate the universal coverage afforded. Compression molding, injection molding, extrusion and extrusion machines, fabricating from thermoplastic sheets, cellular plastics, casting, tooling with plastics, and design of molds and dies are among the subjects covered in 26 chapters.

An excellent reference for the plant engineer in the plastics industry.

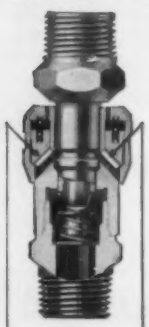
Electrical Efficiency

ELECTRICAL EFFICIENCY IN INDUSTRIAL PLANTS by E. S. Lincoln. Size 9¼ by 6⅛ in. approx.; 235 pp including index; illustrated; cloth bound. Published by F. W. Dodge Corporation, 119 West 40th St., New York 18, N. Y. $9.50.

IN THIS BOOK the author examines closely the aspects of electric light and power costs. The information contained in this book should be particularly helpful to individuals concerned with electrical details of large industrial plants and commercial buildings.

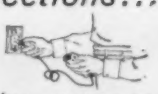
(Continued on page 292)

Wherever you have fluid line connections...



Tamper-Proof Socket Head — with leak-proof, minimum wear, locking device.

—AS EASY AS PLUGGING IN YOUR ELECTRIC SHAVER



- Quick connection and disconnection — as easy as plugging in your electric shaver.
- Instant automatic flow or shut-off.
- Factory assembled socket head cannot be readily damaged — or have component parts lost by casual tampering.
- Locking pins afford large area contact with Plug — reduces wear to a minimum.

Write for the Hansen Catalog

Here is an always ready reference when you want information on couplings in a hurry. Lists complete range of sizes and types of Hansen One-Way Shut-Off, Two-Way Shut-Off, and Straight-Through Couplings.

Representatives in Principal Cities... See Yellow Pages

1960 DESIGN ENGINEERING SHOW NEW YORK MAY 23 to 26 — *Booth 628*

SINCE 1915 — QUICK-CONNECTIVE FLUID LINE COUPLINGS

THE HANSEN MANUFACTURING COMPANY

4081 WEST 150th STREET • CLEVELAND 35, OHIO

For more facts circle 677 on Reply Card

new 1960 RLM Specifications Book

Brings you New and Upward Revised Standards

BUT

...remember this important fact, this new Edition Announcement emphasizes that RLM Specifications for industrial lighting units are not fixed Standards. They are Quality Standards that advance with the Industry and the Science of Illumination.

THE FINAL INGREDIENT

OF BEING SURE

PRODUCT QUALITY
LIGHTING QUALITY

RLM Standards are Product Quality and Lighting Quality Standards for Industrial Lighting Equipment. They are moving standards—they move upward with each advance in the art of illumination and with the technological advances for manufacture. That's why we have annual editions of the RLM STANDARDS SPECIFICATIONS BOOK. That's why the 1960 Edition, now off the press, should be in the hands of all who buy or specify lighting—and its quality specifications should be known to all makers and sellers of industrial lighting equipment. For your complimentary copy, mail the coupon today.

These TWIN QQ's to Industrial Lighting Success are guaranteed with all lighting equipment bearing the RLM Label. And again for 1960, there are new and revised STANDARDS! They include: **New Specs for 1500 MA HIGH MOUNTING FLUORESCENT units. Semi-Direct Porcelain Enameled and Aluminum units. • GROUNDING of all component parts. • CONTINUITY OF GROUNDING throughout a continuous row. • SILVER PLATED CONTACTS in all "rapid start" units. • NEW SYNTHETIC ENAMEL Specification for component parts cover (1) rust inhibiting undercoating (2) adhesion (3) hardness.**

RLM STANDARDS INSTITUTE, Inc. Suite 8315, 326 W. Madison, Chicago 6, Ill.

Send free full information including the New 1960 Edition of the RLM SPECIFICATIONS BOOK. (Please write name, company and address in margin below.)

R-704

For more facts circle 678 on Reply Card

The book tells how to make surveys of power factor, load, voltage, lighting wiring, and electrical protection. Instruments to use in making surveys are discussed with comments as to their selection, continued use, and maintenance.

A group of tables is included showing comparative costs of such items as breakers, power fuses, conduit, and motors. Their purpose is to illustrate comparative studies. The book features many detailed case studies from the author's studies. In his lengthy career the author has designed, operated and managed power systems.

Ventilation

INDUSTRIAL VENTILATION. Size 11 by 9 in. approx; 239 pp including index; illustrated; paper binding with wire backbone. Available from the Committee on Industrial Ventilation, P.O. Box 453, Lansing, Michigan. Price $4.00.

THIS MANUAL should be a handy one to have in a collection of plant engineering references. It is the sixth in a succession of editions and incorporates new material and revisions. The publication is intended as a standard rather than a regulatory medium.

In the opening section of the book proper the general principles of ventilation are briefly discussed; there are various illustrations in this section showing manometer readings of static, velocity and total pressures. Information on two types of ventilation follows, specifically pertaining to dilution and comfort requirements. A distinction is made in this manual between the two types.

Hood design principles are treated in a section including design data and also general rules for hood design relating to the handling of radioactive and high toxicity materials. Many examples of hood design pertaining to specific operations are presented and can serve as guides for related designs in industry.

Two methods of design are subjects of discussion in a section on duct design procedure; listings of the advantages appear side by side. Also incorporated in this section are friction loss charts, tables of air density correction factors, velocity pressures, circular-rectangular duct equivalents and circle data.

Other section topics are: makeup and recirculated air; construction specifications; testing of ventilation systems; fans; and air cleaning devices.

Best way to meet water supply needs

SUMO SUBMERSIBLES

If your plant uses well water supply for any service—processing, fire protection, wash downs or primary water supply—a Sumo Submersible Pump offers decided advantages.

The entire unit—pump and motor—operates completely in the well. Installation is fast and easy. The close-coupled pump and motor design assures high efficiencies and maximum compactness. In addition, you get these other advantages:

- Minimum maintenance
- Noiseless operation
- Flood-proof and frost-proof installation
- No pump house needed
- Self-lubricating design

The SUMO design is backed by over 50 years of specialization in the manufacture of submersible pumps. Both pump and motor are built by SUMO.

Available in 3550 and 1750 rpm, ½ hp through 125 hp with capacities to 3300 gpm. Also available for either horizontally or vertically installed line-booster service.

Write for full information
Bulletin B-1300 has details on construction, selection and application. Send for a copy. Dept. 2.

SUMO PUMPS, INC.
P. O. BOX 983, STAMFORD, CONN.
SALES REPRESENTATIVES IN PRINCIPAL CITIES
For more facts circle 680 on Reply Card

Reduces piping costs ...stops corrosion

Plants, large and small, are switching to unplasticized polyvinyl chloride (UPVC) piping for corrosive services to make these important savings in first costs and in operating costs: UPVC piping materials cost substantially less than metals, alloys or lined material commonly used in the same services. It can be erected easily and quickly. Widely used socket type joint can be made in about a minute with solvent cement and a brush. UPVC piping is easy to handle...weighs less. It does not have to be painted. It stops piping corrosion and galvanic action.

The ttp* line of injection molded UPVC fittings, flanges, valves, solvent cement and thread lubricant is available nearby from your Tube Turns Plastics' Distributor. He can supply *all* your needs on one order and can help you with design and installation data. Write us for the complete line catalog, Bulletin 119. TUBE TURNS PLASTICS, INC., Dept. PE-5, 2929 Magazine Street, Louisville 11, Kentucky.

*"ttp" is a T. M. Reg. U. S. Pat. Off.

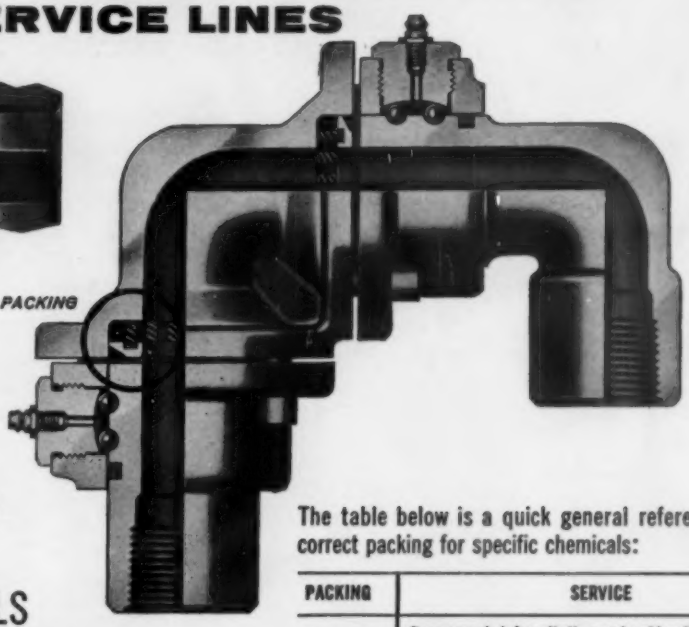
For more facts circle 682 on Reply Card

NEW *CHIKSAN* SWIVEL JOINT

GIVES SAFE, LASTING FLEXIBILITY TO CHEMICAL SERVICE LINES

VIEW ABOVE SHOWS MOLDED PACKING

VIEW AT RIGHT SHOWS DISC PACKING



INTERCHANGEABLE PACKING FEATURE ENABLES **DS SERIES** TO HANDLE A WIDE RANGE OF CHEMICALS IN SERVICES FROM –65°F TO +400°F AT 300 PSI

The DS Series swivel joint with its broad service range can be a valuable new tool in your process system. Use it in chemical loading of tank car or tank truck, for stress relief in piping subjected to vibration, expansion or settling, or as a steam rotation connection between stationary and revolving equipment. Wherever you use it, you'll find it pays for itself in extended service life.

Using a disc or molded type packing, this swivel joint can be applied to handle steam and any of a wide variety of chemicals processed in your plant. And the split segment feature of the DS Swivel Joint allows replacement of packings without removing the joint from the line.

Buy and apply Chiksan DS Series Swivel Joints for chemical service lines in your plant now. You can select from eight basic styles for full rotation in one, two or three planes. For more information write to Chiksan or fill in the coupon below.

The table below is a quick general reference for the correct packing for specific chemicals:

PACKING	SERVICE
Neoprene	Recommended for alkaline and acid salt solutions and aldehydes such as formaldehyde.
Hycar	These should be used for petroleum derivatives, neutral or slightly acidic salt solutions, dilute acids (Sulfuric to 50%, Hydrochloric and Nitric to 20%), alcohols, glycols, ethers, gases (Oxygen not over 500 psi), and vegetable oils.
Butyl	Recommended for liquid or anhydrous ammonia, gases (except oxygen over 500 psi), ammonia derivatives such as hydrazine and for certain hydraulic fluids such as Pydraul, Skydrol, and Cellulube. It is recommended for acetone and methyl ethyl ketone.
Teflon*	Used for concentrated or fuming acids and other highly oxidizing fluids, esters, aromatics, liquid chlorine, bromine and fluorine if temperature is not excessive.
Asbestos	For use in saturated steam service.
Viton "A"*	Recommended for use with concentrated acids, aromatics, liquid chlorine, liquid bromine, chlorine or bromine derivatives, molten sulfur, and carbon disulfide.
Metallic	For extreme services such as hot gas at 600°F., a Stainless Steel metal disc, specially treated to prevent galling, is recommended.

* R.T.M. DU PONT

CHIKSAN COMPANY, 330 North Pomona Ave., Brea, California

Please send me copy of Bulletin No. 1258

Name_____

Company_____ Title_____

Address_____

City_____ Zone____ State_____

CHIKSAN fmc

A SUBSIDIARY OF FOOD MACHINERY AND CHEMICAL CORPORATION

#59-46

CHIKSAN COMPANY—Brea, California • Chicago 5, Ill. • Newark 2, N.J. • Weco (Division), Houston 24, Texas • Subsidiaries: Chiksan Export Co. • Chiksan of Canada Ltd.

For more facts circle 681 on Reply Card

Here's your complete guide to steam heating coils in fan systems

HB Blast Heating Coils for most general purpose heating, ventilating and air conditioning. Copper tube and aluminum or copper fin construction for steam pressures up to 200 psi. Available in face areas from 1.88 to 29.17 sq. ft., standard, medium and low temperature rises.

HD Steam Distributing Tube Coils also used in heating, ventilating and air conditioning systems. Each tube is fed from an inner perforated supply tube providing uniform steam distribution when throttling. Ideal where input air is at freezing temperature. Sizes and performances identical with Blast Heating Coils.

HHX Heavy Duty Coils built with finned tough wrought iron pipe to resist internal and external corrosion in continuous duty high pressure systems and industrial processes—*exclusive with Westinghouse*—face areas range from 3.33 to 29.10 sq. ft., steam pressures up to 200 psi.

Sturtevant Division fan system components include Air Handling, Air Cleaning and Heating & Cooling Products—all from a single source with a single warranty—*best* for service and satisfaction.

Call your Sturtevant Division Sales Engineer or write Westinghouse Electric Corporation, Dept. EE-00, Hyde Park, Boston 36, Mass. *. . . Pioneers and pacesetters in air treatment for 100 years.*

YOU CAN BE SURE... IF IT'S Westinghouse

J-80700

Watch Westinghouse Desilu Playhouse on CBS Alternate Fridays.

For more facts circle 730 on Reply Card

FIRST CLASS
PERMIT No. 11
BARRINGTON, ILL.

BUSINESS REPLY MAIL
No Postage Stamp Necessary If Mailed in the United States

Postage will be paid by

PLANT ENGINEERING
308 East James St.
BARRINGTON, ILLINOIS

MAY, 1960
This card good only until August 31, 1960

PLANT ENGINEERING

Please have manufacturers send without obligation information or bulletins indicated by numbers circled.

(Please print or typewrite)

Your Name..... Your Title.....

Your Company Name.....

Company Address.....City..... State.....

(Company name must be given. If you prefer delivery at home, also fill below)

Home Address.....City..... State.....

PRODUCTS

1	2	3	4	5	6	7
8	9	10	11	12	13	14
15	16	17	18	19	20	21
22	23	24	25	26	27	28
29	30	31	32	33	34	35
36	37	38	39	40	41	42
43	44	45	46	47	48	49
50	51	52	53	54	55	56
57	58	59	60	61	62	63
64	65	66	67	68	69	70
71	72	73	74	75	76	77
78	79	80	81	82	83	84
85	86	87	88	89	90	91

BULLETINS

101	102	103	104	105	106	107	108	109	
110	111	112	113	114	115	116	117	118	
119	120	121	122	123	124	125	126	127	
128	129	130	131	132	133	134	135	136	
137	138	139	140	141	142	143	144	145	
146	147	148	149	150	151	152	153	154	
155	156	157	158	159	160	161	162	163	
164	165	166	167	168	169	170	171	172	
173	174	175	176	177	178	179	180	181	
182	183	184	185	186	187	188	189	190	
191	192	193	194	195	196	197	198	199	
200	201	202	203	204	205	206	207	208	
209	210	211	212	213	214	215	216	217	

DATA FILE

301	302	303	304	305	306	307	308	309	310	311	312	313	314	315
316	317	318	319	320	321	322	323	324	325	326	327	328	329	330
331	332	333	334	335	336	337	338	339	340	341	342	343	344	345
346	347	348	349	350	351	352	353	354	355	356	357	358	359	360
361	362	363	364	365	366	367	368	369	370	371	372	373	374	375
376	377	378	379	380	381	382	383	384	385	386	387	388	389	390
391	392	393	394	395	396	397	398	399	400	401	402	403	404	405
406	407	408	409	410	411	412	413	414	415	416	417	418	419	420
421	422	423	424	425	426	427	428	429	430	431	432	433	434	435
436	437	438	439	440	441	442	443	444	445	446	447	448	449	450
451	452	453	454	455	456	457	458	459	460	461	462	463	464	465
466	467	468	469	470	471	472	473	474	475	476	477	478	479	480
481	482	483	484	485	486	487	488	489	490	491	492	493	494	495

ADVERTISED PRODUCTS, SERVICES

501	502	503	504	505	506	507	508	509	510	511	512	513	514	515	516	517	518	519	520	521	522	523	524	525	526	527	528	529	530	531	532
533	534	535	536	537	538	539	540	541	542	543	544	545	546	547	548	549	550	551	552	553	554	555	556	557	558	559	560	561	562	563	564
565	566	567	568	569	570	571	572	573	574	575	576	577	578	579	580	581	582	583	584	585	586	587	588	589	590	591	592	593	594	595	596
597	598	599	600	601	602	603	604	605	606	607	608	609	610	611	612	613	614	615	616	617	618	619	620	621	622	623	624	625	626	627	628
629	630	631	632	633	634	635	636	637	638	639	640	641	642	643	644	645	646	647	648	649	650	651	652	653	654	655	656	657	658	659	660
661	662	663	664	665	666	667	668	669	670	671	672	673	674	675	676	677	678	679	680	681	682	683	684	685	686	687	688	689	690	691	692
693	694	695	696	697	698	699	700	701	702	703	704	705	706	707	708	709	710	711	712	713	714	715	716	717	718	719	720	721	722	723	724
725	726	727	728	729	730	731	732	733	734	735	736	737	738	739	740	741	742	743	744	745	746	747	748	749	750	751	752	753	754	755	756

Use this space to ask for tear sheets, other information wanted. .....

MAY, 1960
This card good only until August 31, 1960

PLANT ENGINEERING

Please have manufacturers send without obligation information or bulletins indicated by numbers circled.

(Please print or typewrite)

Your Name..... Your Title.....

Your Company Name.....

Company Address..... City..... State.....

(Company name must be given. If you prefer delivery at home, also fill below)

Home Address..... City..... State.....

PRODUCTS

1	2	3	4	5	6	7
8	9	10	11	12	13	14
15	16	17	18	19	20	21
22	23	24	25	26	27	28
29	30	31	32	33	34	35
36	37	38	39	40	41	42
43	44	45	46	47	48	49
50	51	52	53	54	55	56
57	58	59	60	61	62	63
64	65	66	67	68	69	70
71	72	73	74	75	76	77
78	79	80	81	82	83	84
85	86	87	88	89	90	91

BULLETINS

101	102	103	104	105	106	107	108	109	
110	111	112	113	114	115	116	117	118	
119	120	121	122	123	124	125	126	127	
128	129	130	131	132	133	134	135	136	
137	138	139	140	141	142	143	144	145	
146	147	148	149	150	151	152	153	154	
155	156	157	158	159	160	161	162	163	
164	165	166	167	168	169	170	171	172	
173	174	175	176	177	178	179	180	181	
182	183	184	185	186	187	188	189	190	
191	192	193	194	195	196	197	198	199	
200	201	202	203	204	205	206	207	208	
209	210	211	212	213	214	215	216	217	

DATA FILE

301	302	303	304	305	306	307	308	309	310	311	312	313	314	315
316	317	318	319	320	321	322	323	324	325	326	327	328	329	330
331	332	333	334	335	336	337	338	339	340	341	342	343	344	345
346	347	348	349	350	351	352	353	354	355	356	357	358	359	360
361	362	363	364	365	366	367	368	369	370	371	372	373	374	375
376	377	378	379	380	381	382	383	384	385	386	387	388	389	390
391	392	393	394	395	396	397	398	399	400	401	402	403	404	405
406	407	408	409	410	411	412	413	414	415	416	417	418	419	420
421	422	423	424	425	426	427	428	429	430	431	432	433	434	435
436	437	438	439	440	441	442	443	444	445	446	447	448	449	450
451	452	453	454	455	456	457	458	459	460	461	462	463	464	465
466	467	468	469	470	471	472	473	474	475	476	477	478	479	480
481	482	483	484	485	486	487	488	489	490	491	492	493	494	495

ADVERTISED PRODUCTS, SERVICES

501	502	503	504	505	506	507	508	509	510	511	512	513	514	515	516	517	518	519	520	521	522	523	524	525	526	527	528	529	530	531	532
533	534	535	536	537	538	539	540	541	542	543	544	545	546	547	548	549	550	551	552	553	554	555	556	557	558	559	560	561	562	563	564
565	566	567	568	569	570	571	572	573	574	575	576	577	578	579	580	581	582	583	584	585	586	587	588	589	590	591	592	593	594	595	596
597	598	599	600	601	602	603	604	605	606	607	608	609	610	611	612	613	614	615	616	617	618	619	620	621	622	623	624	625	626	627	628
629	630	631	632	633	634	635	636	637	638	639	640	641	642	643	644	645	646	647	648	649	650	651	652	653	654	655	656	657	658	659	660
661	662	663	664	665	666	667	668	669	670	671	672	673	674	675	676	677	678	679	680	681	682	683	684	685	686	687	688	689	690	691	692
693	694	695	696	697	698	699	700	701	702	703	704	705	706	707	708	709	710	711	712	713	714	715	716	717	718	719	720	721	722	723	724
725	726	727	728	729	730	731	732	733	734	735	736	737	738	739	740	741	742	743	744	745	746	747	748	749	750	751	752	753	754	755	756

Use this space to ask for tear sheets, other information wanted. .....

FIRST CLASS
PERMIT No. 11
BARRINGTON, ILL.

BUSINESS REPLY MAIL
No Postage Stamp Necessary If Mailed In the United States

Postage will be paid by

PLANT ENGINEERING
308 East James St.
BARRINGTON, ILLINOIS

BULLETINS

(Begins on page 25)

143 Portable Cords, Cables—Specifications and characteristics of various portable cords and cables are presented in this 52-pp bulletin. Gives pertinent data on insulation compounds and jacket compounds, and includes tables giving properties of 600-v portable cables, from single to four conductor, also single- to four-conductor 601-5000 v portable cables, and others. A section is devoted to splicing and patching cables. Kaiser Aluminum & Chemical Sales, Inc.

144 Power Supply Handbook—Tabular specification data on regulated d-c supplies, frequency changers (variable frequency power sources), high-voltage power supplies (to 600 kv) and other high-voltage products, miniature transistorized power supplies, inverters and converters, and a-c line-voltage regulators are presented in this 32-pp power supply handbook. Technical data on selection included. Sorensen & Co., Inc.

145 Portable Test Units—Presented in this 48-pp bulletin is detailed information on portable test units for protective relays. Subjects treated include classification of relay tests; preparation for protective relay testing; reasons for an adequate testing and maintenance program; tips on tester selection. How the test units can aid in relay functioning is discussed. Multi-Amp Div., Multi-Amp Electronic Corp.

146 Transducer Unit—Features and applications of the Regohm transducer which converts linear or angular motion into electrical action for continuous, automatic control of any electrically controllable device are detailed in Bulletin 5.501. Drawings illustrate details of operation, and specification sheets simplify selection. Electric Regulator Corp.

LIGHTING

147 Lamp Ballast Service—Described in this product bulletin is a service program for fluorescent lamp ballasts which provides immediate replacement of inoperative ballasts. Also described is a 24-hr engineering service for design consultation, installation assistance or trouble-shooting. Universal Mfg. Corp.

148 Miniature Lamp Data—This 24-pp pocket size booklet lists standard miniature lamps now available, and the sources of supply from which they may be obtained. Specifications of the lamps (nearly 400) are given as well as lamp nomenclature with drawings of styles and descriptions of parts. Chicago Miniature Lamp Works.

INSTRUMENTS, CONTROLS

150 Automatic Controls—Selection and application information on a line of automatic controls for steam and water service is presented in this 46-pp Engineer's Manual. Covers controls for fuel oil heaters, heat exchangers for cooling, instantaneous heat exchangers, jacket water cooling, process hot water, pressure reducing, systems. The Powers Regulator Co.

151 Versatile Pressure Gages—Bulletin DH-333 describes heavy-duty, multi-purpose, general utility gages featuring a geared movement and designed for oil, air, water, steam, gas or other media not corrosive to brass or bronze. Engineering data showing construction details, features, applications, specifications, pressure ranges, and dimensions given. Helicoid Div., American Chain & Cable Co., Inc.

152 Miniature Gages—Miniature vertical-type gages with 5-in. scales for measuring and indicating draft, pressure, differential pressure, temperature and pneumatic signals are described in 12-pp Bulletin 59-1. Shows such features as scales and ranges available, mounting dimensions and lighting details. Republic Flow Meters Co., Rockwell Mfg. Co.

153 Motor Operators, Valves—Catalog 407, 24 pp, describes company's electric motor operators and motorized valves, and introduces the new type 2RD, a reversible, proportional unit with instant braking. Fully illustrated with photos and diagrams, booklet covers features, construction details, applications, dimensions. Valves described include butterfly, rotary disc, balanced globe, three-way types. Schade Valve Mfg. Co.

154 Computing System—Featured in this 6-pp bulletin is a transistorized electronic computing system for engineering problems and other data processing. Gives specifications, describes applications and components of the system. Royal McBee Corp.

BOILERS

155 Sectional Test Boilers—Features and advantages of company's test boilers for high temperatures and high pressures are detailed in this product bulletin. They have application in testing research and high pressure steam for production in small quantities. Table of condensed specifications included. Besler Corp.

156 Water-Tube Boilers—Eight-pp Bulletin 4010 describes water tube package boilers designed to fill the steam needs of operations which do not require a boiler with full modulating equipment. Describes control for pressure and temperature operation. Vapor Heating Corp.

CONSTRUCTION

157 Steel Buildings—Advantages of steel buildings for a variety of industrial and commercial construction are detailed in this 8-pp bulletin. Various types of steel buildings are illustrated. United States Steel.

Reader Service Cards for ordering bulletins are on pages 295-296. Be sure to include your name, job title, and company even if you want bulletins mailed to your home address.

158 Movable Partitions—This 12-pp installation manual illustrates and explains how one man, without special tools, can erect a complete system of partitions. Sizes and details such as cutting panels, attaching partitions to existing walls, glazing sizes, and engineering construction drawings are also included, along with panel, wainscotting specifications. Workwall Div., L. A. Darling Co.

159 Side Coiling Partitions—Wood side-coiling partitions, designed to provide compact separation of large areas, such as cafeterias and multi-purpose rooms, are described and illustrated in Bulletin 6003. Provides specifications and design details. The Cookson Co.

160 Industrial Louvers—Featured in Bulletin IL-1 are industrial louvers with curved return blades for more efficient air intake and weather protection. Specifications and dimensional diagrams are included. Bowman Steel Corp.

161 Floor Gratings, Treads—Three basic grating types used in construction are illustrated and described in this 16-pp bulletin. Includes dimensional drawings of these and other gratings; safeload tables for steel grating, aluminum grating, sidewalk slabs. Borden Metal Products Co.

162 Aluminum Grating—Rectangular aluminum grating with permanently-locked bars is illustrated and described in this product bulletin. A table of safe loads, as well as tables of dimensional data included. Kerrigan Iron Works Co.

163 For Non-Slip Walking—Illustrated and described in 8-pp Catalog 1935-16 are Alundum aggregates and non-slip abrasives used to provide safe and wear-resistant walking surfaces. Recommended uses, specifications and method of application are described. Norton Co.

164 Watertight Masonry—Major considerations in designing tight masonry walls are covered in 6-pp Bulletin O.M.-8A. Discussed are mortar ingredients and proportioning, compatibility of brick and mortar, control of shrinkage and bleeding, separation cracks, mechanical disturbances. The Master Builders Co.

165 Colored Concrete—This catalog covers product description, use, methods of application, and colors for a rich, hard, abrasion-resistant, easily maintained, decorative integrally colored concrete material. Detailed specifications for application of the colorundum material by the topping

BULLETINS

(Begins on page 25)

or monolithic method are included. A. C. Horn Companies.

166 Joint Sealant—Circular 53 describes a waterproof joint sealant that bonds permanently to a variety of building materials. Advantages are detailed, application method given. Standard Dry Wall Products, Inc.

168 Socket Screw—Comprehensive technical data on industrial socket screws is presented in this 82-pp reference catalog. Includes design and performance information, and complete specifications, on a variety of industrial fasteners, including socket head cap screws, set screws, shoulder screws, button head screws, pressure plugs and socket screw keys, square head set screws and dowel pins. Standard Pressed Steel Co.

SAFETY, FIRE PROTECTION

169 Safety Equipment—Featured in 28-pp Catalog 36 is a complete line of eye and face protection equipment, including goggles, glasses, helmets, face shields, lenses, respirators and other products. Photos and drawings illustrate design and construction details. Sellstrom Mfg. Co.

170 Fire-Retardant Paints—Twelve-pp, pocket-size Bulletin 100 tells how fire-retardant paints improve safety and reduce potential fire damage. Explains significance of the "safety margin" of extra time at start of a fire, as related to protective action of the paints on both combustible building material and structural metal. The Albi Mfg. Co., Inc.

171 Industrial Apparel—Acid and caustic resistant industrial apparel is described in this 16-pp 1960 Catalog. Characteristics and resistive qualities of dacron and Dynel fibers are detailed, and a swatch card of samples is included. Worklon, Inc.

172 Fire Control Tips—This fire control chart, AD3003R8, shows a line of fire extinguishers and detailed information including ratings. Gives data on Class A, B and C fires and extinguishers suitable for each class of fire. Walter Kidde & Co., Inc.

173 Industrial Fire Hose—Physical and chemical properties of industrial fire hose jacketed with Dacron are detailed in 12-pp Bulletin D-115. Chemical exposure tests tabulated. E. I. du Pont de Nemours & Co.

WATER, WASTE TREATING

174 Zeolite Softeners—Bulletin B5763-A describes the problems caused by use of hard water. Design and construction of company's water softeners is detailed, and selection data, capacities, and other information included. General Filter Co.

175 Upflow Clarification—Features and advantages of the upflow clarification process for sewage and industrial waste treatment are detailed in 8-pp Bulletin B5811. Describes basic functions, and includes pictures, capacity chart. General Filter Co.

TOOLS, WELDING AND HARD SURFACING

176 Time-Saving Tools—Eight-pp Bulletin E-240 illustrates and describes a line of time-saving tools for a variety of industrial applications, including hydraulic benders, hand benders, ratchet benders, hydraulic pipe pushers, cable puller, chassis punches, knockout punches and drivers, power pumps, bits and chisels. Greenlee Tool Co.

177 On Resistance Welding—Illustrated and described in 24-pp Bulletin SP-18 are case histories showing how resistance welding machines are selected or specially engineered for the needs of particular welded products. Illustrates spot, seam, projection, arc, flash-butt welding, as well as metal gathering by resistance heating. The Taylor-Winfield Corp.

178 Aluminum Joining Manual—Presented in this 40-pp manual is a comprehensive survey of aluminum welding, brazing and soldering, covering welding aluminum and its alloys by inert gas shielded metal arc with a consumable electrode, inert gas shielded metal arc with a tungsten electrode, and arc and gas welding processes. Charts of brazeable aluminum alloys, melt and flow charts, charts on composition of aluminum alloys and their mechanical and physical properties are included. All-State Welding Alloys Co., Inc.

179 Flame Spraying Processes—Basic engineering and application data on flame-sprayed coatings of metals, ceramics, carbides and other high melting point materials is presented in 16-pp Bulletin 136B. In addition to covering basic engineering considerations for each process, it includes tables and charts on specific characteristics such as hardness, tensile strength, bond strength. Metallizing Engineering Co., Inc.

180 For Vacuum Metallizing—Application and use of vacuum metalizing coatings which may be applied by spraying, dipping and flow coating to thermoplastics, thermosetting plastics, metals and glass is described in this 45-pp bulletin. Base coats for use before metallizing as well as top coats and back up coats for use after metallizing are covered along with other helpful information on the metallizing process. Bee Chemical Co.

181 Welding Transformers—Technical data on resistance welding transformers, including construction techniques, transformer rating and load demand, magnetizing and load transients, application and duty cycle, are presented in 20-pp Bulletin SP-23. Schematic diagrams, drawings, charts included. The Taylor-Winfield Corp.

Current Publications Of Special Interest

182 Protective Coatings—Bulletin CAC-11-958, 14-pp, describes coal-tar protective coatings. Primarily moisture barriers and impervious corrosion proofers, these coatings are particularly suitable for use on buried or immersed steel and concrete structures. Booklet lists specifications, resistance properties and typical uses for expanded cold-applied coal-tar coatings. Plastics and Coal Chemicals Div., Allied Chemical Corp.

183 Productive Purchasing—Scientific application of analysis techniques to purchasing methods is detailed in 22-pp Bulletin GED-3877. Discusses value analysis—the systematic evaluation of functional value—and includes a checklist for evaluating equipment suppliers which can be used for appraisal of such added values as reliability, technical capabilities, after-sale service, availability, buying convenience. General Electric Co.

184 How to Bend Conduit—This 12-pp pocket-size booklet gives instructions for making precision bends in electrical metallic tubing, rigid steel, and rigid aluminum conduit. Tells how to make the five fundamental bends—angle bends, stub lengths, back-to-back bends, offsets and three-bend saddles. Diagrams show proper techniques for on-the-spot bending of small conduits. Includes offset formulas, shrink tables and "gain" tables. Appleton Electric Co.

185 Steel Drum Care—Use and care of stainless steel shipping and process drums is described in this illustrated 12-pp booklet. Dicusses applications for corrosion-resistant metals, variety of uses for the drums. Lists eight helpful hints on their care and cleaning. Also contains design features, ordering tips and specifications. Inland Steel Container Co.

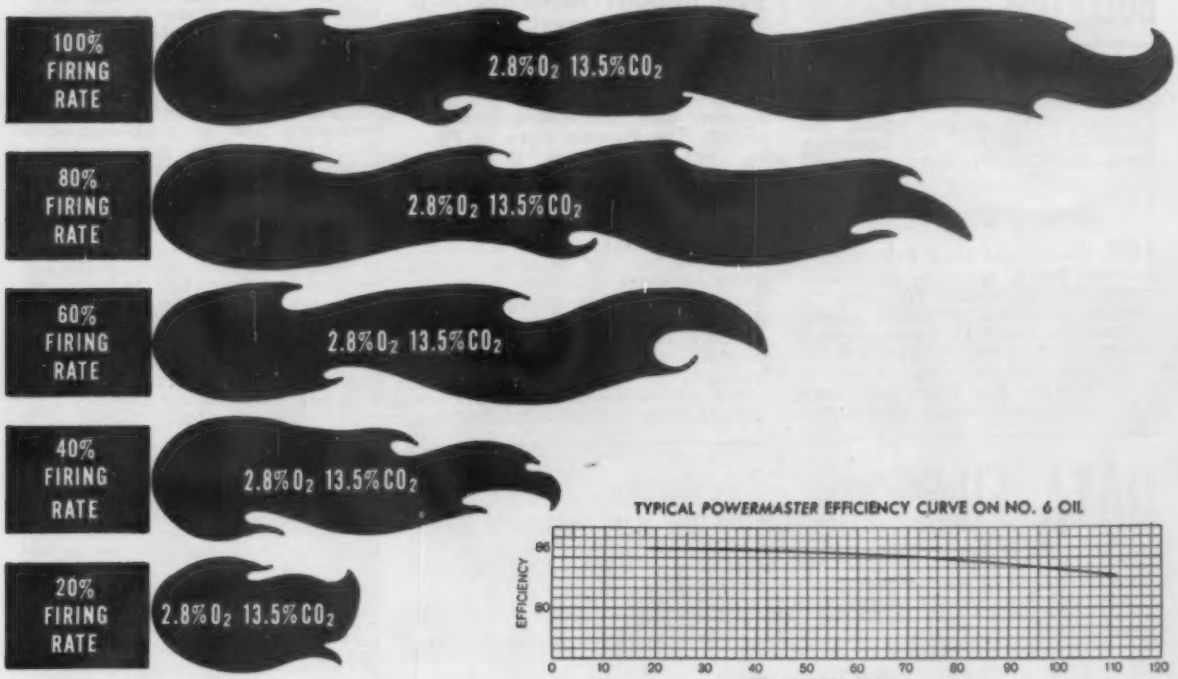
186 Cotton Belting—Standards, characteristics, and applications for untreated belting, synthetic rubber impregnated belting, and wax or bituminous impregnated belting are presented in this 16-pp bulletin. Also includes helpful suggestions for better belt care. Woven Fabric Belting Manufacturers Association.

HEATING, COOLING

187 Heating, Cooling Coil—Bulletin M-8 describes advantages and applications of Panelcoil for heating and cooling. Illustrates and describes standard types, and illustrates construction. Dean Products, Inc.

188 Heat Exchangers—Engineering Manual PB-EM102-A contains 22-pp of illustrations, cutaways, diagrams and design data on impervious graphite heat exchangers, corrosion-resist-

FROM THE WORLD LEADER IN PACKAGED AUTOMATIC BOILERS AND BURNERS



Only *Powermaster*® gives you this type efficiency

Constant fuel-air ratio assures maximum efficiency at any load . . . cuts operating costs . . . returns investment faster

Whether you operate a *Powermaster* boiler from a low of 20% to a high of 100% of capacity, you get the same high constant efficiency. With O&S exclusive 5 to 1 turndown, fuel-air ratio is maintained at all loads with the same low percentage of excess air (2.8% O_2) and high percentage of CO_2 (13.5%).

This constant efficiency is important to you for three reasons: 1. Lower operating costs; 2. faster return on your investment; 3. more uniform heating, more uniform process and improved product quality.

Whether your requirements are for comfort heating, process or power, you'll pay for your boiler investment faster with an O&S *Powermaster*. For information on all *Powermaster* benefits, call your nearest O&S representative or write for Bulletin 1260.

ORR & SEMBOWER, INC.
840 Morgantown Road
Reading, Pa. • Since 1885

Powermaster®
PACKAGED AUTOMATIC BOILERS

For more facts circle 683 on Reply Card

BULLETINS

(Begins on page 25)

ant, high thermal conductivity units. Contains charts, graphs, typical calculations, examples and specifications. The Carbone Corp.

OTHER EQUIPMENT

189 Centrifugal Roof Exhausters—Bulletin 60-CK describes centrifugal power roof exhausters featuring reduction in overall exhauster height. Air moving capacities for 141 models are given, along with dimensional and curb mounting drawings, electrical characteristics and optional accessories. Jenn-Air Products Co., Inc.

190 Industrial Plastics—This 12-pp booklet contains property and application data on mill shapes of nylon, TFE fluorocarbons, polycarbonates, chlorinated polyethers and cross-linked polystyrene. Data on nylon pressure hose and tubing also presented. The Polymer Corp. of Penn.

191 Aluminum Mill Products—Physical Properties, fabrication characteristics and economic advantages of a wide variety of aluminum sheet, plate, rod, bar, extrusion and casting alloys are detailed in this 24-pp bulletin. Various tempers, finishes and patterns available are discussed, aluminum's yield and tensile strength, thermal conductivity and electrical conductivity are graphically compared with those of other materials. Olin Mathieson Chemical Corp.

DATA FILE of literature for the plant engineer's library

STANDARD CATALOGS, bulletins and handbooks are listed to help plant engineers maintain a permanent data file. To get these free catalogs, circle item numbers of those wanted on postage-free cards provided on pages 295 and 296.

VALVES, TRAPS, PIPING

301 Stainless Steel Valves—Corrosion resistant stainless steel valves are featured in 32-pp Catalog 59SS. Features of design and construction are shown through cutaway views, and advantages of stainless steel in withstanding corrosive attack of chemicals and atmospheres are detailed. Jenkins Bros.

303 Pressure Reducing Valve—Bulletin 561-C describes a diaphragm operated pressure reducing valve for steam heat and process steam applications. Design advantages are detailed, and specifications, sizing and capacity data, and dimensions are included. Leslie Co.

304 Blow-Off Valves—Twenty-pp Bulletin B-427 describes blow-off valves for working steam pressures up to 400 lb (boiler blow-off pressures to 415 lb). Both seatless and double-tightening valve types are described and illustrated, operating and servicing data presented, and specifications included. Yarnall-Waring Co.

305 Steam Trap—Bulletin 257 describes features and operation of a steam trap which uses the kinetic energy of steam to close the valve. Operation details are illustrated and capacities tabulated. Sarco Co., Inc.

306 Manual on Traps—This 40-pp engineering manual is designed to assist in the sizing, specifying and selection of steam traps and other fluid specialties. Includes steam trap selection guide, explanation of four basic types of traps and how they perform their function, four steps to follow in sizing a steam trap, table of factors and detailed instructions on how to select steam traps. The V. D. Anderson Co.

307 On Steam Traps—Catalog K is an enlarged 48-pp manual and steam trap catalog. New material provided includes open float and thermostatic traps, pipe strainer to 6 in. steel and semi-steel, and in helpful steam pipe sizing tables. Discusses fundamentals of good trapping, trap selection, installation, testing, repairs. Armstrong Machine Works.

308 Steam Specialties—Detailed information on a line of steam specialties, including steam traps, air traps, ball float traps, strainers, separators, pressure regulators and others, is presented in 46-pp Catalog 69A. Includes complete capacity tables, selector tables, dimensions, operation details, photos and diagrams. Strong, Carlisle & Hammond.

309 Glass Drainline System—Twelve-pp Bulletin PE-30 describes Pyrex brand drainline system for disposal of corrosive wastes. Contains product and property data, information on making joints and hanging, and list of available fittings, as well as schematic drawings tables and specifications. Corning Glass Works.

310 Plastics in Piping—Handbook C-159 16 pp, describes technology of plastic piping systems, installation and coupling methods, standards for plastic pipe. Provides temperature and working pressure chart for valves, and a table of service recommendations showing effects of 280 chemicals on five plastics used in manufacturer's valves. Chemtrol.

311 PVC Pipe, Fittings—This 12-pp bulletin contains latest technical information on polyvinyl chloride pipe and fittings, including advantages and properties, general characteristics and applications, physical flow rate charts and complete specifications. Also included is a chemical resistance chart of various reagents and their effect. Mueller Brass Co.

313 Fluid Line Coupling—Catalog 100 contains data sheets describing company's line of quick-connective fluid-line couplings for pneumatic, hydraulic, oxygen, acetylene, steam, various gases and liquids service. Photos and dimensional diagrams are included. The Hansen Mfg. Co.

315 Swivel Joint—Features and advantages of company's swivel joint which permits fast, easy packing interchangeability are illustrated and described in Bulletin 1258A. Table of specifications and properties are included, as well as dimensional data and diagrams. Chiksan Co.

LUBRICANTS, LUBRICATION

316 Organized Lubrication—Benefits of organized lubrication—major cost control factors are extolled in this 24-pp bulletin. Cost control opportunities are detailed and the task of assigning responsibilities and delegating authority in an organized lubrication system covered. Texaco, Inc.

317 Lubricating Oil—Advantages of company's solvent refined, rust and oxidation inhibited oil tuned to keep maintenance costs lower in such applications as circulating systems, hydraulic systems, paper machine dryer roll bearings, marine turbines and gears, pumps, compressors, fans, gear units, blowers, motors and generators are detailed in this Product Pamphlet SP-8827. Gulf Oil Corp.

318 Product Guide—This handy little booklet gives information on manufacturer's line of industrial products—general lubricants, greases, diesel lubricating oils, metalworking oils, hydraulic oils, heat-transfer oils, waxes, petro-chemicals, spray oils, solvents, others. Sun Oil Co.

INSTRUMENTS, CONTROLS

319 Automatic Control Equipment—Detailed information, technical data and prices on all types of automatic electrical control equipment is featured in 64-pp Catalog 18. Applications, construction details, engineering information and operating features are included, as well as general data and design specifications. Indexed in four sections, covering automatic transfer switches, contactors, special controls and timing devices, bulletin covers a wide range of equipment. Zenith Electric Co.

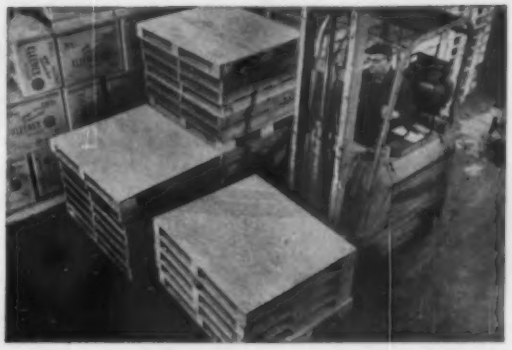
320 Flow Meter Applications—Eight-pp Bulletin MSP-160 describes many applications for company's Ring Balance meter and highlights outstanding features of the versatile instrument. Discusses its use as a wide range flow meter; electronic receiver; computer for measurement of net weight of solids in a fluid stream; Btu measurement in a heat exchanger; electrical flow signal transmitter; ratio controller; others. Controls Div., Hagan Chemicals & Controls, Inc.

A REPORT TO MANAGEMENT ON HOW

Industry cuts costs with FIR PLYWOOD

ROUTE TO:
- ☐ ENGINEERING
- ☐ PRODUCTION
- ☐ SALES
- ☐ PURCHASING
- ☐ MAINTENANCE
- ☐ CONSTRUCTION
- ☐ _____

Fir plywood building components cut costs and speeded construction of this 50,000-sq.-ft. International Paper Co. plant, Auburndale, Fla. Giant plywood box girders support stressed skin roof panels, which incorporate ceiling, framing and roof decking. Panels are paired to form a peaked roof over each 40′ bay, providing large clear floor areas. Exterior walls are overlaid fir plywood, which needs no finish and virtually no maintenance. Construction with light, strong, prefabbed plywood components kept over-all costs to $7.54 psf. The entire structure was completed in only 154 working days.



Switch to plywood from lumber for pallets at West Coast Grocery Co., Tacoma, Wash., has greatly reduced repair and replacement costs. Plywood is smooth, splitproof, splinter-free; nails can't work loose. Easily damaged merchandise gets maximum protection.

Plywood ducts exposed to corrosive chemical wastes at this cellophane plant have required no maintenance in over four years. Exhaust manifolds remove air laden with sulfuric acid mist, hydrogen sulfide, other chemicals and water vapor. Plywood used is high density type, which has a smooth, hard surface, requires no paint or other protection, and is virtually impervious to moisture and most acids and other chemicals.

FOR MORE INFORMATION about fir plywood—its uses, properties and advantages—write

DOUGLAS FIR PLYWOOD ASSOCIATION
TACOMA 2, WASHINGTON

—an industry-wide organization devoted to research, promotion and quality control

Always specify by DFPA grade-trademarks

DFPA TESTED QUALITY

For more facts circle 684 on Reply Card

DATA FILE

(Begins on page 300)

321 **For Limited Panel Space**—Bulletin 532 describes Model 216 indicator used with company's automatic tank contents gage. Bulletin contains a full illustration of indicator which, although occupying a small space, has a scale 20 in. long. The Liquidometer Co.

322 **Mercury Bulb Elements**—Bulletin 851 describes the various types of mercury bulb elements which are the heart of all company's instruments. Basic principles, type and temperature ranges, plungers and interchangeability, element plunger types covered. The Partlow Corp.

323 **Automatic Valve Actuator**—Catalog V-200 describes the Valvmatic, a valve actuating unit designed for converting hand-operated valves to automatic operation. Advantages are detailed and a drawing shows design features. Photos illustrate installation. C. H. Wheeler Mfg. Co.

PUMPS AND COMPRESSORS

324 **End Suction Pumps**—Described in Bulletin 158 are horizontal shaft, single stage, and suction pumps designed for handling abrasive mixtures and slurries, as well as corrosive and hot liquid. Various models in the line are described as to design and application. Nagle Pumps, Inc.

325 **Vertical Turbine Pumps**—Featured in this product bulletin is a line of vertical turbine pumps job-engineered to suit specific applications in industry. Design and construction details are noted. Fiese & Firstenberger Mfg., Inc.

326 **Centrifugal Pumps**—Catalog A-156 describes and illustrates company's line of double-suction single-stage centrifugal pumps. Features are detailed, and cross section drawing and construction details are included. C. H. Wheeler Mfg. Co.

327 **Heavy-Duty Pumps**—Design and construction features of heavy-duty pumps with helical gear reductions are detailed in Section C-27. Dimensions, pump specifications, helical gear reducer specifications and pump capacity table are included. Viking Pump Co.

328 **Air Compressors**—Features and applications of company's air compressors are illustrated and described in Product Bulletin SG-1. Describes various models for a variety of applications. Le Roi Div., Westinghouse Air Brake Co.

329 **Compressed Air Fundamentals**—Sixteen-pp Form 1548A is intended to aid in selecting a small, "packaged" air compressor. Discusses compressed air, how it is compressed, single- and two-stage compressors, piston displacement, control used, etc. Includes information on compressor oils, pipe sizes, wire sizes, terminology, as well as data on air requirements for various pneumatic equipment, air supply tables, cylinder diameter requirements, chart on ratios of compression. Ingersoll-Rand Co.

330 **Industrial Compressors**—Oil-free heavy-duty industrial compressors are illustrated and described in 12-pp Bulletin A-92. Cutaway views show details of internal design and construction, and bulletin includes photos of typical installations, specifications and other data. Joy Mfg. Co.

331 **Stationary Compressors**—Sixteen-pp Catalog 5910 describes features and advantages of a line of stationary air compressors designed for a variety of industrial needs. Tables of weights, code words, and dimensions are included, as well as schematic diagrams, cutaway views showing design details, and other data. Schramm, Inc.

332 **Water-Cooled Compressors**—Featured in 12-pp Bulletin WB10 are two-stage water-cooled air compressors designed to meet the demand for small machines having efficiencies comparable to those of large two-stage horizontal compressors. Cutaway views showing component features are included, as well as general data. Gardner-Denver Co.

PACKINGS, SEALS

333 **Self-Lubricating Packings**—Featured in this 30-pp Bulletin PC-103 is detailed information on company's line of packings with internal lubrication. Application chart, table of physical properties, and ordering instructions. Greene, Tweed & Co.

334 **Internal Mechanical Seal**—Bulletin CP-575 features Chemical & Power internal seals styles IUA and IUB. They are recommended for use at pressures from 28" Hg vacuum to 100 psi and from—80 to 500 F. Chemical & Power Products, Inc.

335 **Mechanical Seal**—Performance and design features of Mechanipak PK mechanical seals for a variety of operating conditions are detailed in 8-pp Bulletin AD-150. Cutaway views, diagrams and tables of dimensional data included. Garlock, Inc.

BOILERS AND GENERATORS

336 **Hot Water Boilers**—Catalog HCC-2, 20-pp describes and illustrates design, construction, advantages and economies of company's controlled circulation hot water boiler for supplying high pressure, high temperature water for heating systems and process applications. Combustion Engineering, Inc.

337 **Hot Water Boilers**—Eight-pp Bulletin 1251 describes packaged automatic boilers for forced circulation hot water systems. Boiler and system design are detailed, and application recommendations and reverse flow are discussed. Tables of dimensions and data are also included. Orr & Sembower, Inc.

338 **Packaged Boilers**—Design features and advantages of company's packaged boilers for heating or processing are detailed in 8-pp Form AD 137. Ratings and dimensions tables are included, as well as specifications and boiler room layout diagram. Cleaver-Brooks Co.

Postage-free Reader Service Cards make it easy to order catalogs. Cards are provided on pages 295 and 296.

339 **Steam Generators**—Advantages of company's steam generators designed to adjust to actual production needs are detailed in this 6-pp Product Bulletin C-731. Schematic diagram showing operating details is included. Clayton Mfg. Co.

340 **Generators, Auxiliaries**—20-pp Catalog SB 60, on steam generators and allied equipment, provides cross section views of major products to show design and construction. Standard and special boilers are included, also burners. Erie City Iron Works.

HEATERS, HEATING

341 **Suspended Type Heaters**—Eight-pp Bulletin 563 features gas-fired suspended type unit heaters for a wide range of industrial applications. Specifications, physical data and ratings are tabulated, as well as capacities for blowers. Dravo Corp.

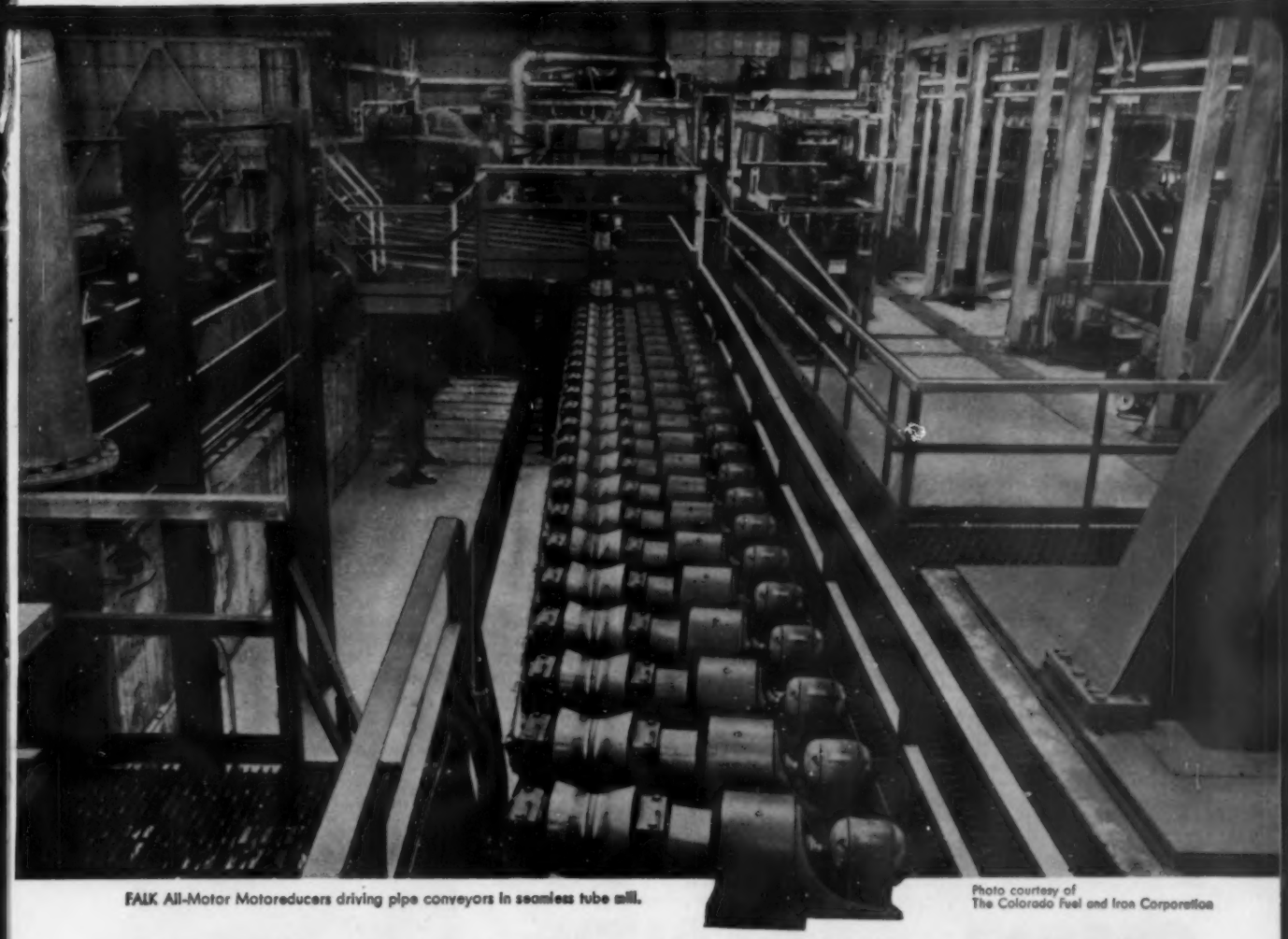
343 **Electric Heaters**—The use of electric heaters to solve trouble heating spots such as lobbies, reception rooms, washrooms, garages, stockrooms, as well as electric heating of entire areas is described in 12-pp Booklet F-1615. Photos and drawings show a variety of typical installations. Edwin L. Wiegand Co.

344 **Water-Cooled Stoker**—Design and operating advantages of the Vibragrate Stoker are outlined in this illustrated bulletin. A large cutaway view details component parts of the stoker. American Engineering Co.

FIRING EQUIPMENT

345 **Industrial Burners**—Advantages of company's industrial burners are detailed in illustrated Bulletin 3. A number of different types for a variety of applications are described and data tables are included. Industrial Combustion, Inc.

346 **Firing Equipment**—Twelve-pp Catalog 6260 covers automatic firing equipment for heating, processing and power, including oil burners, gas burners, dual-fuel burners for gas and oil, forced draft package units, boiler-burner units, coal stokers, factory-wired combustion control panels, etc. Index and selection chart simplify choice of appropriate equipment. Iron Fireman Mfg. Co.



FALK All-Motor Motoreducers driving pipe conveyors in seamless tube mill.

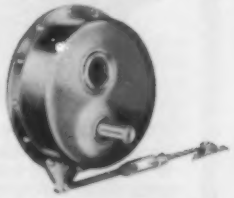
Photo courtesy of
The Colorado Fuel and Iron Corporation

You get these "extras" when you buy FALK *all-steel* Motoreducers

1. **Freedom from damaged housings.** The exclusive FALK *all-steel* construction gives full protection from cracked housings or torn-off feet...plus twice the ability of cast iron to maintain vital alignment.
2. **12-15% reserve load-carrying capacity** in the gears, by AGMA standards. The extra-depth, high pressure angle helical gears are another FALK exclusive ...they assure better operation and longer gear life.
3. **Highest known gear efficiency**—98½% per gear train under full load! This means maximum productive work for your power dollar.
4. **Longer service life**...advanced FALK design makes it possible to machine both bores for each shaft assembly at one time, thus eliminating possible accumulation of tolerances that occurs when individually machined parts are assembled. The result—better alignment of revolving elements that permits units to transmit rated capacity longer.
5. **Standard units to fit your needs.** Integral and All-Motor® Motoreducers are available in horizontal, vertical and right angle types...a type for every use.

Units are available up to 75 hp; output speeds from 780 rpm down to 1.2 rpm. Prompt delivery from factory, warehouse or distributor stocks.
Ask your FALK Representative or Authorized FALK Distributor for *Bulletin 3100*.

THE FALK ALL-MOTOR® MOTOREDUCER
the original All-Motor unit
(Shown) Horizontal concentric model. Also available in right angle and vertical types.



THE ALL-STEEL FALK® SHAFT MOUNTED DRIVE
Proved best for the countless industrial applications where a reducing unit mounting directly on shaft of the driven machine is indicated.
Units from 1/2 to 50 hp. Ratios —4:1, 14:1 or 24:1. Torque capacity up to 41,000 lb-in (in standard units). Prompt shipment from stock. For details, ask for *Bulletin 7100*.

THE FALK CORPORATION, MILWAUKEE 1, WIS.
MANUFACTURERS OF QUALITY GEAR DRIVES AND FLEXIBLE SHAFT COUPLINGS
Representatives and Distributors in most principal cities

For more facts circle 685 on Reply Card

FALK
...a good name in industry

DATA FILE

(Begins on page 300)

FANS, VENTILATING, AND AIR CONDITIONING

348 **Mechanical Draft Fans**—Eight-pp Catalog 1361 describes centrifugal fans designed for handling abrasive gases at elevated temperatures. Complete application, performance and physical data are given, accessories listed. Sturtevant Div., Westinghouse Electric Corp.

349 **Standard Duty Fans**—Designs and construction details of company's line of standard duty fans are covered in 28-pp Bulletin 572. Points out advantages, shows arrangement and application, describes accessories. The New York Blower Co.

350 **Induced Draft Fans**—Catalog L-3 describes induced draft fans designed for any induced draft application for temperatures up to 8000 F. Gives dimensions, capacities, as well as installation data. Fuller Co.

351 **Power Exhausters**—Bulletin 58-B contains 12-pp of detailed information on company's line of power exhausters. Construction features are illustrated and described, and performance and dimensional tables are given. Jenn-Air Products Co., Inc.

352 **Air-Moving Equipment**—Bulletin DB 45, 20-pp, contains detailed information on company's line of roof ventilators, bifurcators, axial flow vent sets, and air jets. Bonded performance ratings are listed on tables, and dimensional data included. De-Bothezat Fans Div., American Machine and Metals, Inc.

353 **Air Engineering**—Bulletin E-57 is a 24-pp air engineering data file covering engineering and test facilities for propellor fans, specifications, construction, maintenance, and installation. Tables for estimating air-handling requirements are provided. Aerovent Fan Co., Inc.

354 **Propeller Fans**—Detailed information on a line of propeller fans and accessories is presented in 20-pp Bulletin A-109E. Dimensional tables, ratings for single, two-propeller and multiblade fans are included. Hartzell Propeller Fan Co.

355 **Propeller Fans**—Design features and applications of heavy-duty propeller fans and related packaged units are detailed in 24-pp Bulletin FM-2345. Photos show a widely diversified range of applications. Buffalo Forge Co.

356 **Ready Units**—Catalog 517 provides 36-pp on complete, ready-to-run centrifugal fan equipment. Capacities 400 to 13,000 cfm, belt and direct driven units. Dimensions included. Clarage Fan Co.

357 **Air Diffusers**—Bulletin 30F present information on company's air diffusers, high velocity valve attenuators, and air recovery equipment. Units are described and illustrated as to design requirements, dimensions. Connor Engineering Corp.

359 **Liquid Cooler**—Bulletin 104R features a liquid cooler for accurate control of chilled water or solutions. Advantages are fully detailed and diagrams showing design features are included. Niagara Blower Co.

DUST, FUME CONTROL

360 **Dust Control Equipment**—Bulletin A-594 describes a line of dust control equipment, including dust filters, cyclone separators and dust collectors. Also features a line of bulk storage and pneumatic conveying equipment. The Day Co.

361 **Dust and Fume Control**—Applications of company's dust and fume control systems in ceramic foundry,

SMALL CAPACITY

Viking Compact Motor-Mounted PUMPS

Capacities ½, 1½ and 3 G.P.M.

This new line of Viking "656" motor-mounted pumps is expressly developed to meet the demand for compact, light weight and integrally mounted units. They're designed for pressure lubrication, filtration, circulation, transferring of liquids up to 7500 S.S.U. and 500 P.S.I. All have the famous Viking "gear-within-a-gear" pumping principle.

- Steel fitted, bronze fitted, all bronze.
- Mechanical seals or conventional packing.
- Single phase 1750 R.P.M. motors—open or explosion proof—¼, ⅓, ½ or ¾ H.P.
- All sizes use same mounting flange bracket.

For more complete information, write for bulletin SP-509Z

VIKING PUMP CO.

Cedar Falls, Iowa, U.S.A.
In Canada, it's "ROTO-KING" Pumps

See Our Catalog in Sweet's
Plant Engineer's File

For more facts circle 686 on Reply Card

Your Idea-Sparker on Electric Cable Control . . .

Write for your free copy of Gleason Catalog, industry's most complete "Idea Book" on profitable application of Gleason Spring Reels, Motor Reels, Hand Reels—for electric cable, cord, and hose control for all equipment in motion. Or write for engineering suggestions.

Representatives in Principal Cities.
In Canada by Railway & Power Engineering Corp., Ltd.

GLEASON REEL CORP.

Dept. P., 800 Horicon St., Mayville, Wis.
TAKE-UP REEL HEADQUARTERS FOR ALL INDUSTRY

For more facts circle 687 on Reply Card

Medium Frequency (1200 TO 12,000 CYCLES) Induction Heating Equipment for Stress Relieving

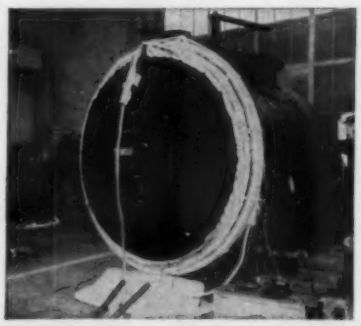
BROWN BOVERI

By Werner K. Haessler, Project Engineer, Brown Boveri Corp.

Brown Boveri manufactures turbine and generator shafts, precision marine gears and other products requiring flawless, stress-free weldments. After thorough testing, the Company adopted medium-frequency induction heating for stress relieving of weldments and for shrink fitting. Compact, mobile power-converters and special heat-resistant, insulated cable were developed . . . adding speed and flexibility to induction heating techniques. Standard sets are now available.

Advantages

Induction heating offers complete mobility not possible with furnaces. Even assembly welds at a customer's plant can be heat-treated. It generates the heat *inside* the metal as compared to furnaces or resistance heaters that heat from the *outside* using high surface temperatures. Thermocouple control allows more accurate adherence to prescribed temperature gradients. Simple cable and insulation arrangements cut labor cost. Cables and work can be covered with asbestos blankets to minimize radiation losses.



Cable arrangement for stress relief treatment of welded flange. Diam. 80", thickness ¾", max. temp. 1148°F. Maximum power: 60 kw at 2.4 kc/s.

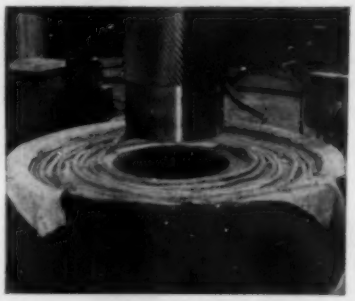
Medium frequency induction heating allows the use of relatively short and light cables with longer cable life. Since only a few turns are required, the energy is concentrated at the welding area allowing substantial power savings. The medium frequency system is adaptable for workpieces from 1/32" thick up to heavy forgings. (Low frequency systems, 50 to 400 cycles, require thick or very long cables and are limited to heating thick, heavy sections.)

Mobile truck for 38 to 110 kw output units. Larger units are also on a mobile chassis. Automatic temperature sequence control. Graph shows record of complete sequence.

Brown Boveri medium frequency converter sets

Frequency kc/s	Power kw	Voltage v	Input* kva
1.2	60	360	90
1.2	110	630	155
1.2	165	720	230
1.2	220	900	300
2.4	50	400	72
2.4	66	540	95
2.4	88	720	127
2.4	130	720	190
2.4	185	900	260
4.8	38	600	60
4.8	55	800	83
4.8	77	540	115
12	44	650	65
12	66	450	95

*3-phase motor input at 220, 440 or 500v, 60c.



Shrinking a gear wheel onto a shaft. The insulating blanket covering the cable has been removed to show the cable arrangement.

All sets are complete on a mobile, 4-wheel chassis. Plug and socket connections are supplied for connecting 2 similar sets in parallel for higher power. Drip-proof housing for outdoor exposure. Power and heat controls provide accurate, automatic heating, soaking and cooling periods with no supervision.

The complete range of Brown Boveri stress relieving units makes it possible to provide the frequency best suited for the specific size, thickness, composition and shape of the workpieces to be treated. In general, the lighter the workpiece, the higher the frequency. Experience has proved, however, that if one machine is to be used for a variety of applications, frequencies in the range of 2 to 2.5 kc are the most suitable.

Upper photo: Cable position during pre-heating at 850°F and welding. Below: Cable windings are simply pushed together and are ready for stress relief treatment up to 1250°F.

Brown Boveri Induction Cable

Highly flexible, heat-resistant. For work temperatures up to 1250°F without water cooling. Can be used for preheating then stress relieving without removal during welding. Bends to radii of 2" or less for easy application to the work. Supplied in easy-to-handle sections of 15 to 50 ft. quickly connected during application. Insulated for 1000v.

Write for complete details and Cost Estimate Questionnaire.

BROWN BOVERI

U. S. Sales and Engineering: Brown Boveri Corp., Dept PL-5, 19 Rector Street, New York 6, N. Y. Agents in 27 U. S. cities.

For more facts circle 688 on Reply Card

DATA FILE

(Begins on page 300)

grain metal, steel and wood industries are illustrated and described in 50-pp Bulletin PE1-2. Design and specification data on centrifugal collectors and units are included. The Kirk & Blum Mfg Co.

MECHANICAL POWER TRANSMISSION

363 **Flange Mounted Drives**—Bulletin 7140 contains selection data for flange mounted drives for a variety of applications. A load classification table is included, as well as tables of minimum sheave pitch diameters, load location factors, overhung load capacities. The Falk Corp.

364 **Fluid Drive**—Eight-pp Bulletin 9819 describes and illustrates adjustable speed Gyrol fluid drives, 1- through 25-hp, giving advantages and applications. Components and operation are also covered in detail. Industrial Div., American-Standard.

365 **Motorized Gear Drive**—Bulletin 2350 describes Line-A-Spede motorized gear drives which are gear reducers powered by standard NEMA frame motors mounted on a shelf attached to the reducer. Illustrates construction features through cutaway view, and includes engineering specifications. The Louis Allis Co.

366 **Worm Gear Reducers**—Single-reduction worm gear speed reducers with a new high-load-capacity thread form are described in 32-pp illustrated Catalog 3805. It covers Delroyd reducers utilizing worm and gear materials permitting maximum ratings allowed by AGMA rating standard. Four types are presented: one for 2½- to 4-in. centers, adaptable to any mounting position; and types for bottom drive, top drive and vertical mounting, for 5- to 12-in. centers. DeLaval Steam Turbine Co.

367 **Belting, Other Rubber Products**—Illustrated and described in 40-pp Bulletin BHM-10 is a line of industrial rubber products, including V-belts and sheaves, V-belting and flat belts, hose and couplings, rubber lined products, and molded rubber goods. Includes dimensional tables, hose selector guide, descriptive data on various types of hose and applications. The Gates Rubber Co.

368 **Transmission Belting**—Application information on company's line of transmission belting is presented in 16-pp Bulletin S-5174. Specific types of belting for a variety of applications is illustrated and described, and technical data tables, and a selection table for drives included. The Goodyear Tire & Rubber Co.

369 **Flexible Couplings**—Comprehensive selection data on flexible couplings is presented in 48-pp Engineering Catalog 60. Misalignment is described and basic coupling arrangements and load classifications are included, along with photos of couplings and installations, diagrams etc. Thomas Flexible Coupling Co.

370 **Anti-Friction Bearings**—Catalog 424-B entitled "The broadest line in the anti-friction field," is an 8-pp folder giving capsule presentation of company's entire product line. A brief description of each product is provided. SKF Industries, Inc.

STORAGE, SHOP EQUIPMENT

371 **Guide to Shelving**—To assist plant engineers in selecting proper shelving for all storage requirements. 64-pp Catalog 30 offers detailed suggestions for correct shelving and storing materials loose and packed parts, record files. Shop equipment and storage cabinets are also described and stockroom planning tips given. Deluxe Metal Products Co., Royal Metal Mfg. Co.

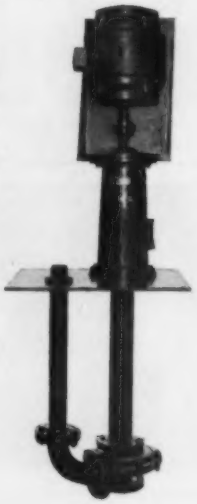
372 **Steel Equipment**—Catalog 100 H contains 92-pp of detailed information on steel cabinets, folding chairs,

This NAGLE PUMP is a "relief" around Industrial Plants!

This Nagle type "CWO-C" vertical shaft centrifugal pump is a "relief" to plant engineers because it gives trouble-free service and is easy to maintain, all parts being readily accessible. It has a non-clogging impeller, designed specifically to handle sludge or abrasive slurries. All parts in contact with material being pumped are of abrasion or corrosion resistant alloy. No bearings below the floor plate—no rubbing contact between revolving and stationary parts below this level.

Available in sizes from 1" to 16", capacities to 8000 GPM, and heads in some cases up to 230'. The type "CDO-C" is similar, but is for dry pit operation.

Nagle pumps are available for handling all types of corrosive, gritty, viscous or hot liquids.



SALES REPRESENTATIVES IN PRINCIPLE CITIES

NAGLE PUMPS

NAGLE PUMPS, INC.
1267 CENTER AVE., CHICAGO HEIGHTS, ILL.

PUMPS FOR ABRASIVE AND CORROSIVE APPLICATIONS

Send for NAGLE PUMP SELECTOR

For more facts circle 689 on Reply Card

FIRST CHOICE FOR PUMPS, VALVES and MIXERS..

PALMETTO®
Braided Asbestos Packing

Five braid over braid style numbers to choose from for reciprocating rods and plungers, slow rotary motion, shallow stuffing boxes, and valve stems.

Get up-to-the-minute data in the Palmetto Self-Lubricating Packings Catalog and Price List. Ask for SLP-659R.

GREENE, TWEED & CO.
NORTH WALES, PA.

For more facts circle 690 on Reply Card

NOW READY!

. . . the completed series of Plant Engineering's

CONSTRUCTION COST ESTIMATING

in handy booklet form.

THIS REPRINT of the twelve sections of our time-saver series contains, in one handy volume, estimating costs for your next building project—from floor slab to roof. It's a reference you'll find you can use.

To get your copy, just clip the coupon below, attach check or money order, and mail it. If you're not a coupon clipper, a letterhead request with your check will get a copy in the mail, pronto!

$1.50 per copy

The Editor, Plant Engineering
308 E. James St., Barrington, Ill.

Please send me —— copies of the 32-page, two-color booklet, Construction Cost Estimating.

I enclose: check ☐ money order ☐ for ____ copies

Name _____ Title _____

Company _____

Street Address _____

City _____ State _____

DATA FILE

(Begins on page 306)

work benches, tool stands, shelving, tool storage, lockers, coat racks, filing cabinets, revolving bins, others. Includes dimensions and specification, as well as installation photos. Lyon Metal Products, Inc.

373 Shop Equipment—Work benches, tool stands, shelving and other pressed steel equipment for the shop, laboratory and assembly line are shown in 8-pp Form 2299. Construction features and specifications of size, top material, equipment variations. Standard Pressed Steel Co.

374 Steel Equipment—Reference Manual 487 contains 64 pp of descriptive data on a line of steel storage equipment, including shelving, bins, doors, slotted angle, drawer units, lockers, benches, grating, counters, and other items. Assembly details and dimensional data included. Equipto.

MATERIALS HANDLING

375 Vertical Transportation—Selection of vertical transportation for every traffic-moving job is detailed in 32-pp Bulletin A-382. Various types of elevators and escalators for a variety of commercial and industrial applications are described and illustrated. Otis Elevator Co.

376 Electric Hoists—Twelve-pp Bulletin DH 133D describes Speedway electric hoists of 500- to 4000-lb capacities. Fully illustrates and explains design features and gives details on suspensions and conducting systems. Clearance data included. Wright Hoist Div., American Chain & Cable Co., Inc.

377 Portable Electric Hoists—Features and operating advantages of Budgit push button and pull cord portable electric hoists are illustrated and described in 8-pp Bulletin 15010. Cutaway views showing component details are included, as well as tables of specifications and outline dimensions. Shaw-Box Crane & Hoist Div., Manning, Maxwell & Moore, Inc.

378 Coil Chain Hoist—Featured in 12-pp Bulletin ADH-65r is a portable, lightweight coil chain electric hoist with pushbutton control. Advantages of the Quik Lift are detailed and features shown on cutaway view, and specification included. Coffing Hoist Div., Duff-Norton Co.

379 Custom Cranes—Twelve-pp Bulletin 5000-B describes and illustrates electric and hand operated overhead traveling cranes, jib cranes, hand hoists, I-beam trolleys, and special crane-type equipment. Covers in particular detail custom-engineered overhead electric traveling crane bridges and electric trolley hoists, available in a wide range of capacities, speeds and spans. Conco Engineering Works.

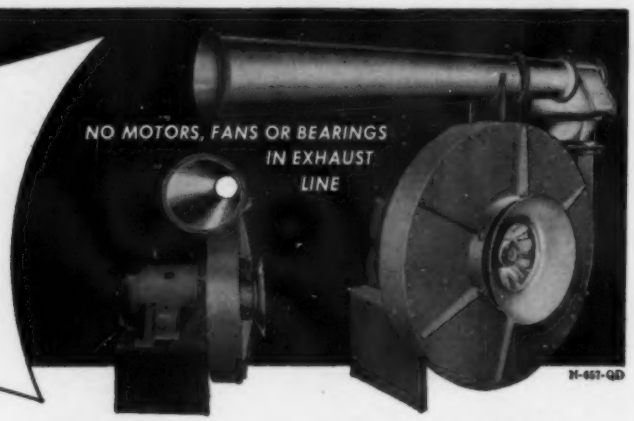
380 Automatic Bulk Handling—Bulletin 531, 12-pp, on new techniques for automatic bulk handling describes pneumatic conveying methods in integrated manufacture. Describes two polyethylene handling installations to show how a system approach to air conveying solves complex handling problems. Dracco Div., Fuller Co.

381 Dragline Conveyors—Trukveyors, a dragline conveying medium designed to reduce unit cost of materials handling in warehouses and plants, are described in detail in 24-pp Book 2497. It covers both the overhead and in-the-floor types, illustrates component features with photos and drawings, and gives installation data. Link-Belt Co.

383 MH Equipment Selector—Sixteen-pp Condensed Catalog 80-204 describes and illustrates manufacturer's line of materials handling equipment. Offers specifications and illustrations on rider fork lift trucks, rider tractors, narrow aisle rider electrics, electric powered walkies and manual equipment. A selector chart shows types. Lewis-Shepard Products Inc.

Now . . .

you can reduce bulk materials handling costs with *Quickdraft* high pressure exhausters



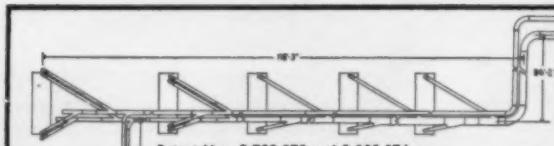
FOR MOVING:

Cement, Sand, Iron Oxide, Wheat, Corn, Salt, Limestone, Castor Beans, Knots, Blocks, Paper, Wool, Cotton, Oats, Rags, Rubber, Vegetables, Coal (Powdered), Shavings, Cork, Sawdust . . . **and any other materials that can be moved by air!**

IMPORTANT NOTICE

For resisting abrasive action, Quickdraft units can be rubber lined. For withstanding corrosive gases, all Quickdraft units are available in standard acid resisting vitreous enamel, No. 316 Stainless Steel, rigid plastics (PVC), and with plastic and Fiberglas coatings.

Time and maintenance savings usually pay for Quickdraft high-pressure exhausters in 6 to 18 months on materials handling jobs. Because material does not pass through blower, maintenance is negligible. Downtime for cleaning and replacing fans, motors and bearings is eliminated. Quickdraft units are also ideal for exhausting paint spray, abrasives, corrosive gases, noxious fumes and high temperatures. For Quickdraft engineering data on materials handling, industrial exhausting, heating plant venting, write today!



Patent Nos. 2,722,372 and 2,855,874. Other Patents Pending. Covered By Exclusive Foreign Patents.

TYPICAL EXAMPLE: Ideal for moving trim from paper, cellophane and plastic slitting machines. (Models range from 4 in. to 30 in. diameter — with 1/6 to 600 H.P. motors — with negative static pressures from 1/4 in. to 60 in. W.G.)

Quickdraft corporation

P.O. Box 87-P • Canton 1, Ohio

Well known for power draft units for all types of heating plants.

For more facts circle 692 on Reply Card

MEMO:

to our readers . . . .

AVAILABLE HELP FOR PLANT PROBLEMS

Many outstanding articles published in Plant Engineering and Power Engineering have been reprinted to assist you in your everyday job problems. Following is a list of the available reprints with prices. Look this list over, decide which ones you want, fill in the coupon at the bottom of the page and send it to us with your check or money order.

Some of these reprints are in comparatively short supply so get your order in early.

Which one (ones) will serve you best?

ORDER No.	INFORMATION	UNIT PRICE
1	Atomics—48-page booklet of material which has been appearing in Power Engineering on atomic energy development throughout the world.	$1.00
2	Industrial Lighting—12-page manual covers lighting factors a plant engineer should consider. Discusses voltages, costs, etc.	0.50
3	Fluid Power Maintenance—48-page booklet on the selection, installation and maintenance of the various components of pneumatic-hydraulic systems.	0.75
4	Industrial Ventilation—8-page manual presents new, thought provoking ideas on industrial ventilation. Such points as measuring and controlling radiant heat and how to find the comfort range are discussed.	0.25
5	Effective Start-Up Engineer Smooths Out Preliminary Power Plant Operation—16-page reprint covers effective scheduling of start-up, checking of condensate, boiler feed and circulating water systems.	1.00
6	Construction Specifications—20-page reprint of five-part article on construction specs. Discusses what should be included in specs; payments, arbitration; construction bids; signing contract; progress report and final inspection. A copy of "General Conditions" will accompany the reprint.	2.00
7	Your New Industrial Power Plant—How to Get It Into Operation—24-page reprint of series of articles by Paul N. Garay from 1957 issues on building your new plant right and how to set up operating records.	1.00
8	What It Costs to Modernize Small Industrial Power Plants—24-page reprint of series of articles by H. D. Fisher from 1957 issues, giving six case studies of plants from 25,000 to 50,000 lb of steam per hour capacity.	1.00
9	Cherry-Hill—16-page reprint of article describing what construction preplanning is necessary. Article discusses use of consultants, methods of bidding, basic concepts, selling the project to management.	0.50
10	A Power Plant Primer—32-page reprint of article by A. W. Kramer explaining the fundamental principles of the steam-electric power plant and of each unit of principal equipment, showing how they all operate.	1.00
11	Pumps—4-page reprint of article "Pumps—and Why They Have Troubles." Some of the points covered in article: sagging foundation, distortion of base plate, proper packing and its importance	0.10
12	Construction Briefs—12-page booklets. Booklet No. 1—covers beam reactions, bending moment, moment of inertia and section modulus. Booklet No. 2—deflection, horizontal shear and floor loading. Booklet No. 3—columns, trusses and welded connection. Booklet No. 4—fastenings for timber, design of trussed roof and structural design. Booklet No. 5—Designing in Reinforced Concrete.	0.50 for each Booklet 1 to 4 0.75 Booklet 5

Enclose your check or money order with the coupon below. Postage on reprints will be paid by us.

EDITORIAL DEPARTMENTS
TECHNICAL PUBLISHING COMPANY
308 EAST JAMES STREET BARRINGTON, ILLINOIS

Circle number(s) for the articles you desire.

1	2	3	4	5	6
7	8	9	10	11	12

Name _____

Company _____

Address _____ 5-60

Power -Flex

POWER AND FREE
OVERHEAD CONVEYOR SYSTEM*

WITH TELEMATIC
AUTOMATIC DISPATCH CONTROL

• *Simply set dials and Telematic guides carrier to any station in system*

POWER RAIL
FREE RAIL

Employs exclusive unitized "over and under" power and free rail which permits simple switching to right or left as desired.

Power-Flex is designed for automated materials forwarding applications in industrial plants, distribution centers, service buildings and department stores. The most economical system available for loads up to 600 lbs. per carrier. Savings in actual installations range from 25% to 60%.

*Systems in service for your inspection.

Engineered to your very specific requirements.

SEND FOR BROCHURE

Inquiries from your engineers or consultants welcomed.

CM CONVEYORS

COLUMBUS McKINNON CHAIN CORPORATION
Conveyor Division
TONAWANDA, N. Y.

For more facts circle 693 on Reply Card

To save time . . .
Every Tool Box Needs
a compact, easy-to-carry

RIDGID®

Drop Head Threader Set

Snap a die head in the ratchet ring . . . cut your thread! It's as simple as that with a RIDGID drop head threader. Heads can't fall out . . . dies reverse quickly for close-to-wall threading. Finest quality RIDGID long wearing dies. Conduit dies available.

Call Your Supply House!

Hand Carrier Free With All Sets Except No. 12-R

(Order in sets or any combination)

Exposed Ratchet Type

For pipe—⅛" to 1"—00-R
⅛" to 1¼"—111-R
⅛" to 2"—12-R
For bolts—¼" to 1"—00-RB

Enclosed Ratchet Type

For pipe—⅛" to 1"—0-R
⅛" to 1¼"—11-R

RIDGID®

The Ridge Tool Company • Elyria, Ohio, U.S.A.

DATA FILE

(Begins on page 300)

384 **Cost-Cutting Materials Handling**—"The How Book of Cost-Cutting Materials Handling," is a 24-pp booklet covering various phases of the materials handling problems and their effect on industrial production. Text and pictures cover such subjects as fundamental handling motions, advantages of planned material handling practices, handling organization. The Yale & Towne Mfg. Co.

385 **Caster, Wheel Manual**—Featured in 192-pp Manual 65 is comprehensive information on company's complete line of casters, wheels, glides, desk shoes and accessories. Profusely illustrated with photos and dimensional drawings and diagrams of the various types of casters and wheels for a variety of applications, the manual contains tabulated engineering and price data. Darnell Corp.

SLINGS, CHAINS, WIRE ROPE AND FITTINGS

386 **Sling Handbook**—Form SL-3 is an illustrated 40-pp reference book covering more than 80 subjects on slings and fittings. Included in this revised edition is reference information condensed into handy chart form on sling types, dimensions and rated loads. Union Wire Rope Corp.

387 **Sling Chain Handbook**—Illustrated Data Book 100. 32-pp, presents "how to do it" information on sling chains —from ordering to care, use and inspection. Contains diagrams, charts and tables on standard and special styles of the sling chains. Columbus McKinnon Chain Corp.

388 **Wire Rope Manual**—"Inspection of Wire Rope," "Methods of Lubricating Wire Rope," "Use and Abuse of Wire Rope," and "Sheave Maintenance" are among subjects covered in this 188-pp Wire Rope Manual, Catalog G-16. In addition, there are sections devoted to strengths and weights of wire rope, cable assemblies, and rated capacity of slings. Manual is available to qualified plant engineers. Macwhyte Wire Rope Co.

389 **Sling Chains**—Steps to follow in ordering sling chain for particular applications are outlined in 16-pp Catalog S-558. Lists grades of chain available for sling chains and their specifications, working load limits and information on care and use of sling chains. Campbell Chain Co.

390 **Drop Forged Fittings**—Comprehensive data on company's line of drop forged fittings for wire rope and chain are presented in 40-pp Catalog 950-2. Includes specifications, dimensions, rated capacities and weights. Also announces range of sizes and capacities in many of items listed, as well as new products, including clips. Crosby-Laughlin Div., American Hoist and Derrick Co.

CONSTRUCTION

391 **Fire-Resistant Resin**—Structural panels, skylight louvers, chemical ductwork and other products made of Hetron, permanently flame-resistant polyester resin are covered in this bulletin. Table lists characteristics. Durez Plastics Div., Hooker Electrochemical Co.

392 **Fir Plywood**—This 34-pp construction guide contains full-page structural drawings providing basic information on types, grades, and applications of fir plywood. Booklet covers information on floor construction. Douglas Fir Plywood Assn.

393 **For Roof, Wall Construction**—Included in this literature file are product bulletins describing roof and wall construction materials. Bulletin 59C covers corrugated sheets; 59W, insulated walls and metal panels; 595, insulated sandwich curtain walls and roofs; Bulletin 60D, steel and aluminum roof deck; Bulletin 60F, high-strength permanent steel forms for concrete roof and floor slabs; and Bulletin 60R, conveyor hoods and curved corrugated sheets. Elwin G. Smith & Co., Inc.

394 **Reglazing Panels**—Described in this product sheet is a translucent fiber glass panel designed for replacement of shattered and fractured panes of wire glass in top hinged continuous operated and fixed steel sash. Installation diagrams are included. Butler Mfg. Co.

395 **Acrylic Plastic Sheet**—This 12-pp Booklet PL-415 describes properties and characteristics of Plexiglas acrylic plastic sheet. Applications in a variety of industries are illustrated and advantages detailed. Rohm & Hass Co.

396 **Daylighting Products**—Featured in 22-pp Bulletin 585 are corrugated roof skylighting, built-up roof skylighting, Consolite skylights, continuous sash and siding, monitor and masonry walls, insulated walls, monitor with ventilating units, reglazing and vents. Physical properties of Resolite are listed and characteristics described. Drawings and diagrams illustrate details and table gives specifications. Resolite Corp.

397 **Structural Glass**—Catalog 60-I contains essential data on company's line of rolled, figured and wired glass for a variety of industrial applications. Advantages and important functions are described, and light distribution tables and specifications are included. Mississippi Glass Co.

398 **Aluminum in Colors**—This bulletin introduces Alcoa's Alumalure colored aluminum architectural building sheet products, a complete line of sheet products offered in 11 colors. Aluminum Co. of America.

399 **Rolling Steel Doors**—What is involved in specifying and installing industrial rolling steel doors? Can rolling steel doors be a factor in making production operations safer, more flexible? These and other questions are answered in 16-pp Bulletin G-59—a manual and guide including requirements for installation, specifications, drawings and dimensions. The R. C. Mahon Co.

400 **Corrosion-Proof Flooring**—Bulletin 120-A describes a monolithic corrosion-proof flooring material developed for application over concrete to protect against acids, alkalis and solvents. Specifications are included. The Ceilcote Co., Inc.

401 **Steel Floor Plate**—Features and advantages of rolled steel floor plate are detailed in this Product Form 3184. Table of dimensional data is included, as well as illustrations of installations. Alan Wood Steel Co.

402 **Steel Floor Plate**—Skid resistance and other advantages of USS multigrip rolled steel floor plate are stressed in this illustrated bulletin. Also gives dimensions, data on loads. United States Steel Corp.

403 **Grating and Treads**—Safety, visibility, permanence and easy maintenance are among advantages of open flooring discussed in 28-pp Bulletin 2527-R. Covers use of electro-forged grating in a wide range of industries also features grating applications in sidewalks, locks and dams, sewage treatment plants. Information provided includes types and spacing. Blaw-Knox Co.

404 **Steel Grating**—Featured in 16-pp Bulletin 14R are company's steel grating and stair treads for a variety of industrial applications. Pictures of typical installations are included. Kerrigan Iron Works, Inc.

405 **Joining Aluminum Parts**—The question, "What are the best ways to mechanically join aluminum parts?" And others about mechanical fastening methods for aluminum are answered in this 32-pp technical handbook. Covers nails and pins, metal stitching, mechanically formed joints and architectural fasteners. Reynolds Metals Co.

INSULATION

406 **Acoustical Insulation**—Described in this Product Bulletin F-190 is a fiber glass insulation designed for keeping duct systems quiet. Advantages are detailed and installation methods illustrated. Pittsburgh Plate Glass Co.

RIDGID No. 2-S
Spiral Reamer
⅛" to 2" Capacity... Self-Feeding for Least Effort

For Smooth, Easy Reaming it has to be
RIDGID

No. 2
⅛" to 2"
Capacity

No. 3
⅜" to 3"
Capacity

RIDGID
"LonGrip"
Reamers
No Thinned or Flared Walls

Take your choice—Spiral or "LonGrip"—you can't beat these RIDGID Reamers. For hand reaming, you probably prefer the effortless self-feeding Spiral; for power use, the "LonGrip" five-fluted reamers. Heat-treated cutting edges offer extra-long service . . . will not dig in and thin or flare walls. All RIDGID Ratchet Reamers come equipped with handle.

Your Supply House has them. For smoother, faster reaming, order yours today.

RIDGID
The Ridge Tool Company • Elyria, Ohio, U.S.A.

For more facts circle 695 on Reply Card

DATA FILE

(Begins on page 300)

407 Duct Insulation—Thermal and acoustical duct insulation made of long textile-type glass fiber is illustrated and described in this 8-pp Builetin ULD-859. Includes detailed application specifications, data on characteristics of the duct liners, thermal efficiencies, sound absorption data. Gustin-Bacon Mfg. Co.

TOOLS, WELDING, AND MACHINE SHOP EQUIPMENT

408 Pipe Tools—Ordering and application information on Rigid pipe tools is provided in 16-pp illustrated Catalog 7596R-6. Wrenches, cutters, threaders, reamers, vises, and others are pictured and described, also power drives. The Ridge Tool Co.

409 Portable Electric Tools—Form 10 features a complete line of portable electric tools including drills, screwdrivers, impact wrenches, magnetic drill presses, sanders, grinders, hammers, holesaws, and forged tools. The Black & Decker Mfg. Co.

410 Masonry Bits—Catalog M B C-56 describes carbide-tipped masonry bits for drilling holes in tile, brick, concrete, granite or any other kind of masonry. Specifications are included as well as a table giving chuck and shank requirements to adapt to different electric or pneumatic hammers. New England Carbide Tool Co., Inc.

412 Hydraulic Power Tools—Bulletin A-5-58 covers independent pump hydraulic jacks, single and double plunger hand pumps and double acting air engine pumps. Advantages are detailed. H. K. Porter Co., Inc.

413 Power Tool Guide—Thirty-pp Catalog 105 describes 70 portable electric tools and kits with over 400 accessories. Buying guide includes pictures of tools and their applications with complete specifications and prices for electric saws, sanders, drills, planes, routers, shapers, and combination tools. Porter-Cable Machine Co.

414 Welding Wires—Submerged arc and inert gas welding wires are featured in Bulletin DH-402-C. Typical applications of various stainless steel, low alloy, and mild carbon steel automatic welding wires are described. Page Steel & Wire Div., American Chain & Cable Co., Inc.

415 Welding Equipment—Twelve-pp Bulletin W-158 features a line of transformer, rectifier—and rotary d-c welders for a variety of industrial requirements. Detailed specifications and dimensional data are included. Harnischfeger Corp.

416 Data for the Shop—"Fluids and Facts for Metal Working" is a pocket-size booklet of about 44-pp. A section on metal working fluids covers their function and selection, preparation and use of soluble oil and paste compounds, and prevention of dermatitis. Conversion tables, steel numbering systems, machinability ratings. Standard Oil Co. (Ind.)

SAFETY, SANITATION

417 Fire-Resistant Fluids—This series of specification sheets describes company's line of fire-resistant fluids including synthetic, oil-water emulsion and glycol types. Physical characteristics and other data are provided. Mobil Oil Co., Inc.

418 Special Fire Protection—Devoted to special hazard fire protection, this 44-pp booklet covers both equipment and methods. Tells how to recognize special fire-hazards conditions in a plant. Discusses in detail major types of fire protection, telling how each functions, giving its advantages and limitations, and illustrating some examples of successful use. Grinnell Co., Inc.

Your ideal source for custom-designed cranes

CONCO

A crane, custom-tailored in every detail to your client's needs, is available from Conco at a practical cost. Here you'll find engineering experience spanning 35 years, and unique plant flexibility that permits easy handling of specialized cranes — spark and explosion proof, indoor-outdoor, circular, and cranes employing closed circuit TV for remote-control operation. May we submit a proposal on your next crane requirement—whether standard or highly specialized.

CRANES HOISTS CONCO

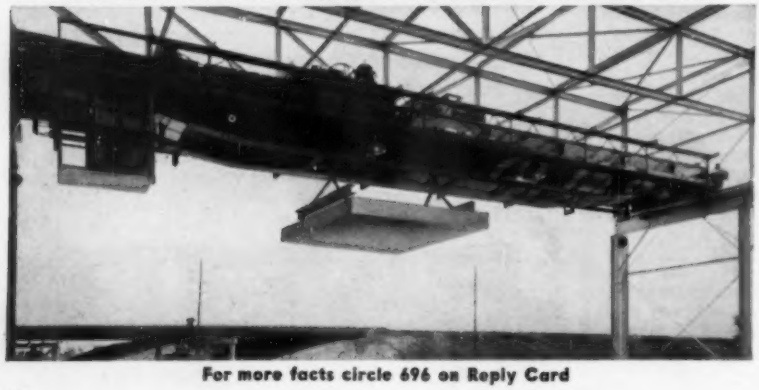
Write for Bulletin

Material Handling Division

CONCO ENGINEERING WORKS, INC., Mendota 13, Illinois

AFFILIATES { Spartan Tool Division—Powered Sewer Cleaning Equipment
Field Control Division—Barometric Draft Controls
Conco Building Products, Inc.—Brick, Tile, Stone

Conco CRB Electric Crane used for indoor-outdoor service at Underwriters' Laboratories, Chicago.



For more facts circle 696 on Reply Card

You'll find two postage-free Reader Service Cards on pages 295-296. Use them for ordering product information—just circle item numbers of the products you would like to know more about. You may also use the cards for requesting advertised catalogs.

"When we increased our participation, our company benefits jumped!"

"I'm convinced that any company benefits by the Payroll Savings Plan. When employees invest regularly in U.S. Savings Bonds they feel more secure; they know they're helping themselves to safeguard their futures. Savers are *safer* workers, too. And they're proud to help build a stronger America.

"Logically, then, the more employees we have enrolled, the greater our own benefits will be. So I began wondering *how many* of our people were subscribers. When I checked, I got the surprise of the week—less than 30%!

"Of course, we have a certain amount of turnover: new people coming in constantly...some leaving for other jobs. Then, too, many of our employees just never got around to signing that handy little card.

"Right away I talked with our State Savings Bonds Director. With his help we carried the Payroll Savings Plan story to *every* person in our firm. You know, Bill, people like to be invited, *personally*, to join a group like this.

"Our response to this friendly canvass was amazing. Now we have better than 45% of our staff enrolled—and the percentage is gaining every payday."

If *your* company has less than 50% employee participation in the Payroll Savings Plan, you are missing substantial benefits. Contact your State Savings Bonds Director for expert, friendly help in making a person-to-person canvass in your company.

ALL U.S. SAVINGS BONDS—OLD OR NEW—EARN ½% MORE THAN BEFORE

PLANT ENGINEERING

THE U. S. GOVERNMENT DOES NOT PAY FOR THIS ADVERTISEMENT. THE TREASURY DEPARTMENT THANKS, FOR THEIR PATRIOTISM, THE ADVERTISING COUNCIL AND THE DONOR ABOVE.

DATA FILE

(Begins on page 300)

419 **Soaps, Soap Equipment**—Characteristics and advantages of company's liquid soaps are described in this 15-pp bulletin. Dispensing equipment for these soaps is also illustrated and described. West Chemical Products Inc.

ELECTRICAL

421 **Drip-Proof Motors**—Bulletin 857 contains 12-pp of detailed information on company's line of open drip proof and totally enclosed fan cooled motors. Construction features are described and table of engineering data and specifications included. Brook Motor Corp.

422 **Trolley Busway System**—Three bulletins offer help on electrical installations involving cranes and hoists, assembly and production lines, test lines and other moving electrical equipment. Bulletin 60, 40-pp, covers 60 amp systems; Bulletin 70, 32-pp, covers 225-500 amp systems; Bulletin 75, 44-pp, covers 100 amp systems. Each includes special section on installation planning and procedure, mounting. Feedrail Corp.

424 **Electrical Controls**—Featured in this 80-pp Bulletin LO-11 is a line of electrical control equipment, including safety switches, service control, load centers, and accessories. Describes design and construction features, and includes detailed selection tables and case dimensions, wire and conduit tables, and a numerical price list. Cutler-Hammer Inc.

425 **Enclosed Switches**—Catalog 83, 22-pp, Catalog 84, 16-pp, and Catalog 101, 24-pp, describe enclosed switches for industrial uses. Included are general switches designed for use on either a-c or d-c applications, sealed switches, heavy-duty limit switches, hand operated switches, and maintained-contact switches. Micro-Switch Div., Minneapolis-Honeywell Regulator Co.

426 **Safety Switch Design**—Advances in safety switch design are illustrated and described in this 28-pp Product Bulletin CPD-74. Features designed to increase safety, save in space, and provide for easy installation and long life are stressed. General Electric Co.

427 **Individually Enclosed Breakers**—U-Re-Lites, new individually-enclosed low voltage power circuit breakers, are detailed in 8-pp illustrated Bulletin 4261-2B. Information includes design, installation and safety features, enclosure dimensions, ratings, application and selection charts. I-T-E Circuit Breaker Co.

428 **Protective Equipment Guide**—Form SPD is a 24-pp handbook on selection of protective devices for electric circuits, motors, appliances and apparatus, and is based on 1959 National Electrical Code. Besides providing suggestions on how to select right kind of protection equipment, booklet provides wiring diagrams and motor tables. Bussmann Mfg. Co.

429 **Wiring Devices**—Catalog 60, about 80-pp, presents ordering data on wiring devices including a wide range of switches, convenience outlets, lampholders, fluorescent devices, cord connectors, adapters, wall plates, accessories etc. Fully illustrated with photos, catalog provides condensed information on features, dimensions, applications. Pass & Seymour, Inc.

430 **Distribution Equipment**—Detailed information on company's line of electrical distribution equipment is presented in 82-pp '60 Marketeer, Catalog M-160. Among equipment described are Electrostrip multi-outlet assemblies, switches, lighting panelboards, power panelboards, switchgear assemblies, and various types of electrical duct. Tables of essential data. BullDog Electric Products Co., Div. I-T-E Circuit Breaker Co.

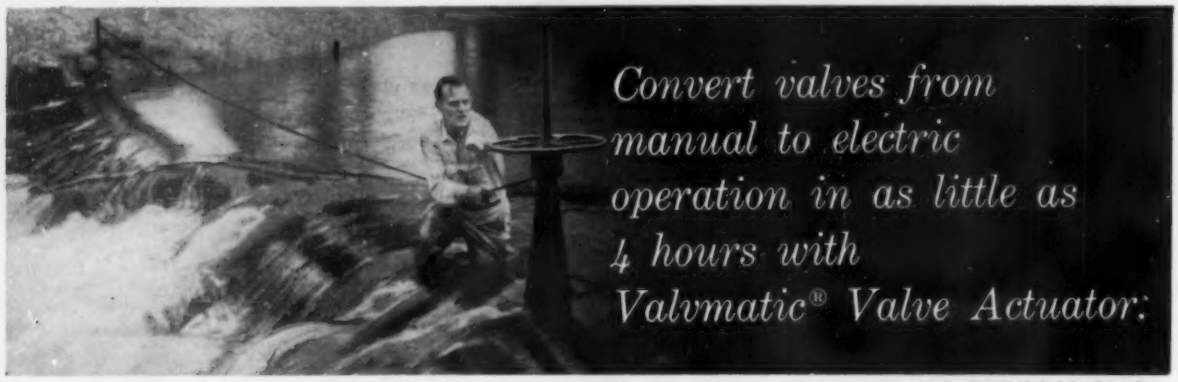


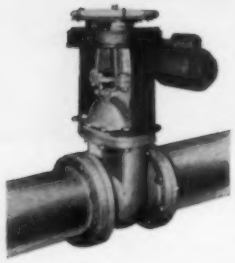
Photo by Philadelphia Inquirer

Now you can eliminate hand operation of hard-to-turn or remotely located valves with economical, easy-to-install Valvmatic.

- No special engineering or special tools
- No disturbance of piping or adjustment of valve
- No downtime of the system
- No replacing of existing valves
- No special wiring

Low initial cost. Minimum installation cost. Valvmatic converts either existing or new valves to push-button locally or remotely controlled operation. Suited also to automated or microwave applications.

High torque, instantly reversible motor, either totally enclosed or explosion-proof. Torque and position control for both directions of operation. If power fails, valve can be restored to manual operation in a few seconds. Performance tested by leading industries.



Write for Catalog V-200 today!

C. H. Wheeler Manufacturing Co.

19th and Lehigh Avenue, Philadelphia 32, Pa.

WV-148

For more facts circle 699 on Reply Card

PROPELLAIR®
Ventilating Equipment

Electronic speed test in Propellair's wind tunnel

FOR RUGGED DUTY... NEW design axial fans *in sizes up to 60 inches!*

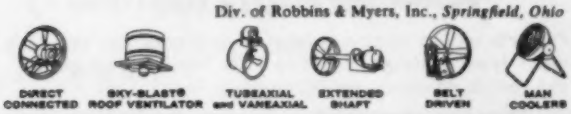
Move corrosive or explosive fumes, extreme heat or high humidity with new PROPELLAIR Type BT belt driven axial fans. They feature heavy 10 and 12-gage drums . . . isolated, air-cooled, protected bearings and belts . . . airfoil propellers cast of hi-strength aluminum-magnesium alloy . . . Robbins & Myers *"All-Weather"* motors for a single nameplate guarantee on the complete unit.

Hi-pressure, big hub propellers are available for those tough applications developing high resistance.

Send today for complete information on this modern, efficient fan. Ask for Bulletin 620—PE

PROPELLAIR®

Div. of Robbins & Myers, Inc., *Springfield, Ohio*



DIRECT CONNECTED · SKY-BLAST® ROOF VENTILATOR · TUBEAXIAL and VANEAXIAL · EXTENDED SHAFT · BELT DRIVEN · MAN COOLERS

MOVING AIR IS OUR BUSINESS®

For more facts circle 700 on Reply Card

NEW... REVOLUTIONARY

ABC®
ALL CLASS

Patented

THE ONLY FIRE EXTINGUISHERS APPROVED BY UNDERWRITERS' LABORATORIES FOR ALL CLASSES OF FIRES: CLASS A, B, C AND MAGNESIUM

Manufactured for
ALIM CORPORATION
Manufacturers of Saf®
Fire Retardant Paints
by STOP-FIRE Inc.,
New Brunswick, N.J.

Write to
ALIM CORPORATION,
11 Park Place,
New York 7, N.Y.

for full information
Specify Brochure F-31

Distributed in Canada by Levitt Safety, Ltd., Toronto

For more facts circle 701 on Reply Card

DATA FILE

(Begins on page 300)

431 **Electrical Equipment**—Collected in this bound catalog is a series of bulletins on company's line of electrical equipment, including electric motors, generators, motor-generator sets, switchboards and controls. Cutaway views showing details of design and construction are included, also engineering and specification data. The Ideal Electric & Mfg. Co.

432 **Electrical Equipment**—Condensed Catalog No. 9 contains 48-pp of descriptive data on company's line of electrical products, including conduit bodies, conduit fittings, connectors, ground fittings and EMT fittings. Dimensional data and features are shown. Gedney Electric Co.

434 **Flexible Electric Conduit**—Performance and application data on company's line of flexible plastic covered electrical conduit. Liquatite, are featured in this illustrated brochure. Electri-Flex Co.

436 **Wire and Cable Data**—Bulletin 629 contains 28-pp of useful tables, typical examples, engineering data, and wire and cable terminology. Covers such items as annealed copper wire properties, copper resistance temperature factor, standard concentrically stranded annealed copper wire, properties of aluminum conductors, tensile strength of copper wire, and other data. National Electric Div., H. K. Porter Co., Inc.

437 **Cable Support**—Described in 28-pp Catalog 5912 are two types of cable trays or tube raceways, the ladder type and the basket small opening type, for cable, wiring and tubing support. Detailed dimensional data, transverse loading data, specifications, photos and diagrams are included. The Globe Co.

438 **Conductor Systems**—Features and operation details of company's conductor systems for electrification of overhead materials handling equipment are detailed in Product Bulletin 2016-D. Advantages of the power bars are described. Cleveland Tramrail Div., The Cleveland Crane & Engineering Co.

439 **Commutator Maintenance**—This commutator and slip ring maintenance data file contains information on methods and procedures for more efficient commutation. Individual bulletins cover brushes, sparking, picking, dragging and other troubles, maintenance tools and how to use them. Ideal Industries, Inc.

441 **Control Batteries**—Bulletin CP-540 describes features and advantages of a line of batteries for control, switchgear and auxiliary power. Engineering details and specifications are tabulated. C. & D Batteries, Inc.

442 **Silicon-Rectifier Chargers**—Technical data on constant-voltage, silicon-rectifier charges for stationary-type batteries are presented in Data Sheets Section 90.41, 90.44, and 45. Includes curves and statistics on charger performance at various electrical loads; data sheets also contain diagrams and instructions for installing associated alarms and ground detection systems. Exide Industrial Div., The Electric Storage Battery Co.

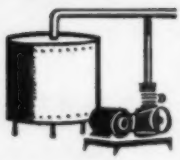
443 **Battery Technology**—Bulletin GB-1896 is a 36-pp handbook of technical instructions and engineering data on the care of motive power storage batteries. Covers all phases of lead acid battery theory, operation and maintenance. Captioned line drawings are included, as well as basic information on specific gravity changes, charging and discharging cycles, plate composition. Gould-National Batteries, Inc.

444 **Electrical Equipment Digest**—Electrical equipment illustrated and described in 160-pp Catalog Digest 142, includes load centers, circuit breakers, low voltage con-

Steelcote
THROUGHOUT AMERICA
PLANT MAINTENANCE MANAGERS CHOOSE
DAMP-TEX
WET WALL ENAMEL
TRANSFORMS WET, ROTTING WALLS TO SANITARY BEAUTY
SEND FOR DETAILS OF NO-RISK TRIAL OFFER: Prove Damp-Tex's superiority in your own plant.
This bactericide, fungicide system is a pioneer and leader in its field. Its efficient, durable performance in thousands of plants is your best guarantee of satisfaction.

FLOOR-NU
STOPS
FLOOR DAMAGE
FROM ALKALI,
ACIDS
AND HEAVY LOADS

SEND FOR NO-RISK TRIAL QUANTITY. Send for 26-lb. unit. Use half. If not satisfied return balance prepaid for credit on entire unit.



To Prevent Chemical and Water Corrosion of
EQUIPMENT
The Most Permanent Finish Is
EPO-LUX 100 (EPOXY)

Protects where chemical liquids or fumes eat up other type coatings. Dries to 75% hardness of glass yet resists chipping or cracking.

STEELCOTE MFG. CO. 3418 GRATIOT ST. ST. LOUIS 3, MO., U.S.A. RODNEY, ONTARIO, CANADA

For more facts circle 702 on Reply Card

Clean up faster with the Oakite SANISEPTOR

Here's simple, low-cost mechanized cleaning. Put Oakite detergent into the Oakite SANISEPTOR, connect to any hot water outlet – and you're in business! No pump, steam supply, coils. Worked by your own hot water pressure, the SANISEPTOR throws a jet-stream of hot detergent solution for fast, effective cleaning. Twist a valve for instant rinsing action. Weighs only 25 lbs., so you can use it everywhere – on walls, floors, ceilings, washrooms, hard-to-reach places. For details call your local Oakite man or write to Oakite Products, Inc., 21A Rector Street, New York 6, N. Y.

OAKITE

over 50 Est. 1909 years' leadership in industrial cleaning

SCIENCE

For more facts circle 703 on Reply Card

plant engineer

With a minimum of ten years experience in power distribution, steam generation, construction and maintenance of chemical process facilities.

Excellent opportunity for advancement in a dynamic and expanding medium sized organization.

Box #2069, c/o Plant Engineering
308 East James Street
Barrington, Illinois

New G-E Grounding Outlet offers 5 features for tighter, safer, more convenient connections

1. **Screwless Pressure-Lock* terminals give better electrical and mechanical connections.** Laboratory temperature-rise tests against standard screw terminals prove better electrical contact. Pull-out tests prove tighter grip.
2. **Back-wired Pressure-Lock terminals are safer.** Pushing into box tends to seat wires better; totally enclosed connections protect against shorts.
3. **New terminal configuration permits looping.** Each line terminal takes 1 or 2 cut wires or 1 loop and 1 cut wire. (Nos. 14 or 12 Awg sizes — can be intermixed.)
4. **New, larger release slots** permit releasing wires quickly with standard-sized screwdriver.
5. **Grounding terminal takes single, double or looped wire** — in tight, screw-clamp connection.

Other quality features: Double wipe contacts; long, plaster-cleaning mounting screws, held captive in strap. 15A-125V. Listed by U. L.; meets Federal and REA specifications.

Ask your G-E distributor for Duplex Grounding Outlet No. GE4091, in ivory or brown. General Electric Company, Wiring Device Department, Providence 7, Rhode Island.

*Trade-mark of General Electric Company

Progress Is Our Most Important Product

GENERAL ELECTRIC

For more facts circle 704 on Reply Card

DATA FILE

(Begins on page 300)

trol, fusible service equipment and accessories, meter sockets and troughs, safety switches, panelboards, duct and fittings, starters. Square D Co.

445 **Polyethylene as Insulation**—Bulletin RCT 710 is a 10-pp technical paper on flame retardant polyethylene as insulation for wire and cable. Generously illustrated with tables and charts, this paper includes a bibliography and an appendix giving specifications for black flame-retardant polyethylene jacket insulation. Rome Cable Corp.

446 **Aluminum Fittings**—Catalog 59 contains 38-pp of data on aluminum fittings, including circuit breakers, cluster lighting, conduit bodies, connectors, couplings, dust-tight fixtures, elbows, fixture hangers, flanges, flood lighting, switch fittings, instrument boxes, junction boxes, motor starters, reducers, panel boards and others. Descriptive data given. Killark Electric Mfg. Co.

LIGHTING, COMMUNICATION

447 **Industrial Lighting Data**—New specifications for incandescent and mercury vapor uplight porcelain enamel and aluminum high mounting units, "all white" incandescent specs and many upward revisions in specifications for industrial fluorescent fixtures are included in 44-pp current RLM Specifications Book. Contains complete specifications for 14 basic types of most widely specified industrial lighting units. RLM Standards Institute, Inc.

448 **Emergency Lighting**—Twenty-pp Publication 243A features emergency lighting systems for commercial, industrial and other types of buildings. In addition to describing the systems, catalog contains complete information on components. The Standard Electric Time Co.

449 **Area Floodlighting**—Planning for lighting of parking areas, construction sites, other open areas is detailed in 16-pp Bulletin 2719. Contains reference guides for selecting incandescent or mercury floodlights, general purpose or heavy duty types, and for determining how many floodlights are needed based on size of area to be lighted, as well as footcandle charts. Crouse-Hinds Co.

450 **Lighting Fixtures**—This 12-pp condensed catalog gives a compact presentation of company's fluorescent and Brascolite incandescent luminaries. Data on surface and pendant mounted units, recessed luminaries, and Gratelite electric ceilings provided. Edwin F. Guth Co.

452 **Mercury Vapor Lamps**—Featured in 8-pp Bulletin 89 is a line of standard mercury lamps, as well as reflector type lamps for indoors and outdoors. Mercury candlepower curves are given along with other lighting data. Radiant Lamp Corp.

453 **Communication System**—Featured in this bulletin is a transistorized communication system designed to provide communication between two or more persons or departments regardless of distance or surrounding noise conditions. Operating features detailed. Gai-Tronics Corp.

455 **Signal Equipment**—Tips on how to select suitable signals for any specific operations are offered in Bulletin 100. Describes horns, bells, warning lights, other signal equipment. Specifications, photos, wiring diagrams, dimensions, audibility rating charts, electrical characteristics. Federal Sign & Signal Corp.

FENCING

456 **Chain Link Fence**—Catalog F-915, 64-pp, contains illustrated information on company's line of chain link fences of aluminum or steel for a variety of industrial,

SEE a demonstration by a specialist

reduces absenteeism

KEEPS INDUSTRIAL HANDS ON THE JOB

NEW! non-depleting LAN-O-KLEEN® PLUS Hand Cleaner

for FREE demonstration or literature address:
WEST CHEMICAL PRODUCTS INC., 42-20 West St., Long Island City 1, N. Y.
Branches in principal cities • IN CANADA: 5621-23 Casgrain Ave., Montreal

WEST CHEMICAL PRODUCTS INC.

ARMSTRONG BROS.

Better PIPE TOOLS

PIPE VISES

"ARMSTRONG BROS." Pipe Vises. Standard Hinged Vises have drop forged (unbreakable) hooks, and replaceable tool steel jaws. Smaller vises have 1-piece jaw which prevents kinking of small or thin wall pipe. T-Handles have oval ends that will not pinch hands. The Open Side Vise mounts on a bench, truck, or with special chain attachment on any post or tree. The Chain Vise has drop forged base, jaws and handle. Chains are proof-tested. Patented 1-piece jaw prevents damage to small pipe, thin wall conduit or tubing.

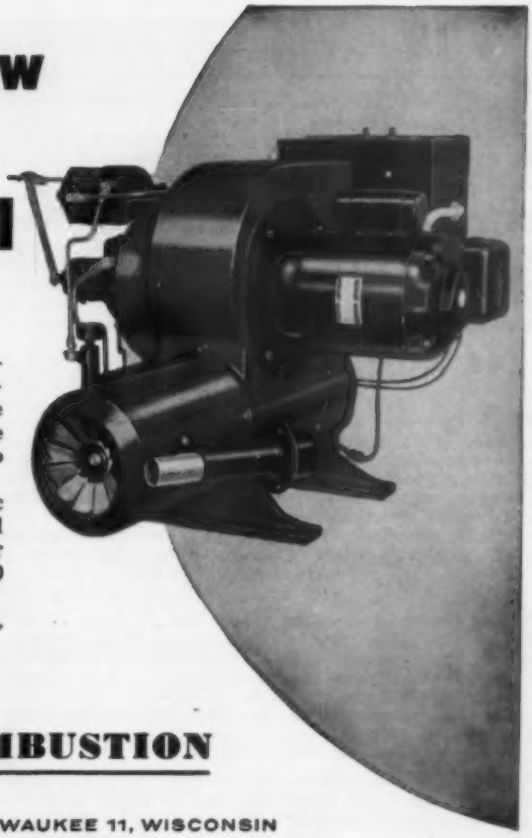
Write for Pipe Tool Circular

ARMSTRONG BROS. TOOL CO.
5207 N. ARMSTRONG AVE., CHICAGO 30, ILL.

For more facts circle 705 on Reply Card

For more facts circle 706 on Reply Card

Keep heating costs low with HEV-E-OIL commercial-industrial burners



Hev-E-Oil burners furnish all the air necessary for combustion, assuring perfect fire control under all weather conditions. Low fire start that builds up gradually to the flame size required means smooth, safe operation. And once the burner is set for greatest efficiency, it *stays* that way no matter what the weather.

A complete package! Fire tested! Automatic, electronic controls. Meets all codes. Easy to install . . . Hev-E-Oil models from 5 to 150 gph. Also available, Hev-E-Duty power gas burners and combination gas/oil burners from 720,000 to 21,000,000 B.T.U.

For more information write Industrial Combustion, Inc., 4507 N. Oakland Ave., Milwaukee 11, Wis., Dept. PE-50.

INDUSTRIAL COMBUSTION INC.

EXECUTIVE OFFICE: 4507 N. OAKLAND AVE., MILWAUKEE 11, WISCONSIN

For more facts circle 707 on Reply Card

Vibratone HORNS ARE BETTER because—

THEY ARE MORE COMPACT

Small size simplifies storage and handling. Small size permits unobtrusive installation or concealment in public buildings. Small size permits "out of the way" mounting, to avoid physical damage, in industrial applications.

Advanced engineering created the louder, better sounding, more desirable, and better looking Vibratone. It will fit your signal requirements just as nicely as it fits in a 4" outlet box.

Specify Federal Vibratones for your signal installations. Investigate. Ask for Bulletin #105.

FEDERAL SIGN and SIGNAL Corporation

13615 S. Western Ave. Blue Island, Ill.

For more facts circle 708 on Reply Card

Bay PRODUCTS

immediate shipment on complete line

Specify BAY, the finest value in steel equipment, and be sure of receiving products which are designed properly—produced properly—unconditionally guaranteed. And you will receive them quickly!

OUR RECORD:
Over 15 years satisfied use by leading national companies.

THE REASON:
Our equipment is its own best salesman.

Write now for Free Catalog, Complete Pricing Information, and the name of your local Bay Distributor.

WORK BENCHES
STEEL SHELVING
HANDICABINET® BENCHES
STOCK CARTS
SERVICE TRUCKS
STACKING BOXES
PARTS BINS
SMALL PARTS CABINETS AND CASES

BAY PRODUCTS DIV.
AMERICAN METAL WORKS, INC.

1805 W. Cambria St., Phila. 32, Pa. BAldwin 9-1805

For more facts circle 709 on Reply Card

DATA FILE

(Begins on page 300)

commercial and other applications. Detailed specifications and dimensional data are included, also photos of installations. The Colorado Fuel and Iron Corp.

457 **Aluminum Fencing**—A comprehensive review of aluminum's role in the growing fence market today is presented in this 12-pp booklet. Outlines details of typical installations of aluminum chain link fence. Complete technical data on strength, resistance to corrosion, and durability is presented. Aluminum Co. of America.

MAINTENANCE

458 **Protective Coatings**—This 38-pp comprehensive treatise (Form 259) on rust and corrosion control by protective coatings contains a gate-fold spread showing actual color standards of company's primers and top coatings. Covering water resistant, heat resistant, floor coatings, heavy-duty chemical resistant coatings, galvanized metal coatings, wire fence roller coatings, and quick-dry coatings, booklet contains full-color application photos and 110 color chips, technical section. Rust-Oleum Corp.

459 **Protective Coatings**—Described in 8-pp Form PC 50 are industrial protective coatings for a variety of specific applications. Characteristics of a coal tar-epoxy resin coating, Gilsonite-asphalt matics, and cold applied coal tar coatings and application methods are fully described and advantages detailed. Pittsburgh Coke & Chemical Co.

460 **Steel Surface Protection**—Described in this bulletin are properties and advantages of Dimetcote 3, an inorganic zinc coating which "cold galvanizes" any steel surface. Typical applications are illustrated and general properties listed. Amercoat Corp.

462 **Metal Treatment**—Featured in this product bulletin is a metal treatment designed to be applied directly on rusted metal to stop rust action and provide a sound base for maintenance paint. Advantages described. Rusticide Products Co.

463 **Coatings for Industry**—Detailed information on a variety of coatings for industrial application, including anti-corrosive coatings, decorative finishes, exterior wall and roof coatings, floor materials, fungus and mold treatments, industrial coatings, interior wall coatings, roof coatings and other products, is presented in 40-pp Catalog 59. Properities are covered. Steelcote Mfg. Co.

465 **Corrosion Control Systems**—This booklet is designed as a guide to primary protection and preventive maintenance of all metal surfaces subjected to chemical attack of acids and alkalis, fumes and gases, active industrial solvents, and severe industrial weathering. Principal protective systems are described and properties and uses, primer coats and finish coats listed. Truscon Laboratories, Devoe & Raynolds Co., Inc.

466 **Masonry Treatments**—Waterproofing, protective and corrective treatments for masonry are described in this 22-pp specification guide, Circular 17. Describes products and their applications, includes photos of typical applications, and suggested specifications. Standard Dry Wall Products, Inc.

467 **Color Conditioning**—How to put the power of color to work profitably is explained in this 28-pp color conditioning booklet. Tells how color conditioning boosts production, improves morale and promotes safety, and includes some full-color photos to illustrate "before-and-after" situations in typical plants. E. I. du Pont de Nemours & Co., Inc.

CAN YOU USE THIS
GIANT
UNIVERSAL DRIVE?

2,000 hp/1,000 rpm.

Koelling engineers developed the first heavy duty universal drives to connect oilfield mud pumps with powerful engines. Proved by 3 years world wide service, the principles have been incorporated into Torq-Ring Model 500, an industrial universal drive. This new Koelling drive is now available to all industries with special universal drive problems.

KOELLING TORQ-RING FEATURES

1. Double raced bearing eliminates wear on yoke.
2. Open end bearing design, self purging when lubricated.
3. Positive mechanical blocks prevent incorrect field assembly.
4. Eight inch sliding spline speeds installation and allows for machinery adjustment.
5. Choice of flange connection to customer needs.

Write or call today for engineering information.

KOELLING UNIVERSAL JOINTS, INC.
5526 Dyer Street • Dallas 6, Texas

For more facts circle 710 on Reply Card

FAST REPAIR, PATCHING FOR FLOORS...

- Asphalt Mastic—Flooring Clay Emulsion Binder
- Latex Concrete Patch (small work)
- Latex Industrial Flooring (large work)
- Epoxy Flooring —for problem floors

Keep factory and other work floors comfortable and accident free with these Flintkote Flooring Products—all are trowel finished.

For complete information on mixes, coverage, uses and speed of application write: The Flintkote Company, Industrial Division, 30 Rockefeller Plaza, New York 20, N. Y.

FLINTKOTE

Manufacturer of America's Broadest Line of Building Products

For more facts circle 711 on Reply Card

completely automates intermittent operations

ZENITH

Multi-Operation TIME SWITCH

AS MANY AS 48 "ON" AND 48 "OFF" OPERATIONS CAN BE HANDLED. The Zenith Multi-Operation Time Switch provides 24-hour automatic control of all types of equipment day after day. Schedule is set up on an easy-to-operate control dial scaled to 15-minute calibrations. Tripping clips are non-removable but easily slide to the ON or OFF position. Calendar cutout to provide for non-working days is available as an accessory.

Switch is powered by a heavy duty synchronous industrial motor. Rated at 1000 w., 60 cycle ac.

ASK FOR FULL INFORMATION. Request complete catalog on company letterhead describing Zenith Automatic Transfer and Remote Control Switches, Magnetic Contactors, Program Clocks and Timing Controls.

See Classified Directory for Name of Factory Representative

ZENITH ELECTRIC CO.

152 WEST WALTON STREET • CHICAGO 10, ILLINOIS

For more facts circle 712 on Reply Card

Check with-

DARNELL

to meet your exact needs

There is a type of Darnell Caster or Wheel for every kind of use and floor. Made for light, medium and heavy-duty service, you are sure to find in the Darnell line the exact caster or wheel to meet your individual requirements . . .

YOUR DISTRIBUTOR CAN HELP YOU — CALL HIM

EXACTLY THE CASTERS AND WHEELS YOU WANT Right Off Your DARNELL Distributor's Shelf!

Send for Your FREE Copy...

More than 4000 Models

Look in the YELLOW PAGES under CASTERS

Look in the YELLOW PAGES under CASTERS

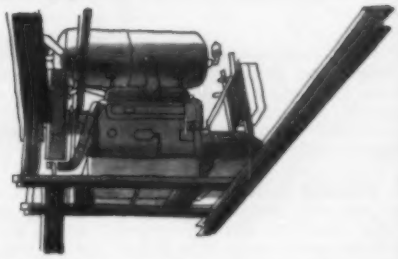
DARNELL CORPORATION, LTD.

DOWNEY (Los Angeles County) CALIF.
37-28 SIXTY-FIRST, WOODSIDE 77, L.I., N.Y.
36 NORTH CLINTON ST., CHICAGO 6, ILL.
1000 PEACHTREE N. E., ATLANTA, GA.

For more facts circle 713 on Reply Card

YOU'LL SAVE MORE WITH SCHRAMM COMPRESSORS!

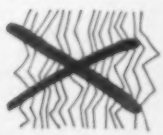
1 they're compact!



can be installed in minimum space -- overhead, or on floor - at low cost!

2 they're vibration-free!

last longer! are easier on floors, buildings, too



3 they need no costly foundation

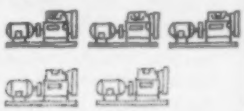
save expense of reinforcing floor - just bolt down!

4 they're easy to move

relocate any time to meet emergencies, changed layouts

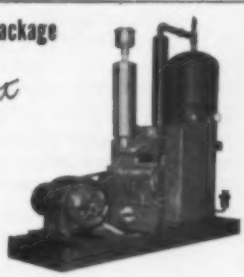
5 they fit a unit system

buy only the compressors you need add units as you expand



6 they're a complete package

everything you need for any air equipment in one unit



Schramm Stationary Compressors are electric motor or V-belt driven . . . 50 to 600 cfm. Write for Bulletin SSB-59.

Schramm
AIR COMPRESSORS

665 North Garfield Ave., West Chester, Pa.

For more facts circle 714 on Reply Card

DATA FILE

(Begins on page 300)

468 **Basic-Roofing Information**—"What You Should Know About Your Roof" is a 40-pp clearly illustrated booklet which tells what makes a roof fail, how to recognize signs of roof deterioration, what to do to keep a roof in good condition. Discusses roofing practices. Johns-Manville.

469 **Floor Maintenance**—Many types of industrial floors are studied and their soil removal problem analyzed in this 8-pp booklet, complete with charts, list of cleaning compounds, and descriptions of cleaning methods. Methods of sanitizing, stripping wax and paint, and of absorbing liquids told. Oakite Products, Inc.

470 **Pyramid Ladders**—Catalog 158, 20-pp, describes a line of pyramid-design step ladders, as well as hydraulic lifts and fixed or adjustable-level work platforms for above-floor working safety. Illustrates 35 new models of ladders for working heights up to 15 ft, gives detailed specifications. Ballymore Co.

METALS

472 **Ferrous Metal Products**—This ring-bound product guide is made-up of a series of booklets covering a wide product range, including hot rolled sheets and strip, cold rolled sheets and strip, galvanized sheets, enameling iron and Ti-Namel sheets, electrical sheets, hot rolled bars, reinforcing bars, rail steel bars, shapes and bands, structural shapes, tin mill product and others. Dimensional and specification tables are included. Inland Steel Co.

473 **Aluminum and Steel Data**—Comprehensive selection data on aluminum and steel available in stock for almost every application is presented in this 242-pp buying guide. Necessary weights, dimensions and descriptive data are tabulated. Individual sections cover structural shapes, construction products, plates, sheets, hot rolled bars, cold finish bars, alloy and tool steel, tubing, stainless steel, aluminum, others. Joseph T. Ryerson & Son Inc.

OTHER EQUIPMENT

474 **Filters for Industry**—Illustrated and described in this product bulletin are filters for a variety of applications in industry. Among those covered are liquid filters, intake filters, pipe line filters, dry and viscous panel filters, precipitators, Electro-Staynew mist collector, and a dual action filter. The Dollinger Corp.

475 **Industrial Stack**—Detailed information on a permanent, low cost refractory smoke stack for commercial and industrial applications is contained in 8-pp Bulletin IS-32. Gives product information, applications with boilers, etc. Van-Packer Co., Div., The Flintkote Company.

476 **Automatic Air Products**—Featured in 22-pp Bulletin 157 are automatic air products, including separators, afterdriers, filterators, filters, line drains, governors and kits, combinations, regulators, and lubricators. Advantages are detailed and operation described. Wilkerson Corp.

477 **TV at Work**—This 8-pp brochure, "How Many Jobs," covers an extensive line of industrial television equipment. Shows cameras, control units, monitors, accessories, and projection systems. Varied applications, including installations with unusual engineering requirements are pictured. General Precision Laboratory.

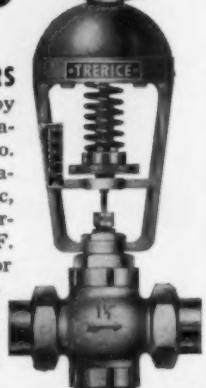
478 **Hinged Closures**—One-man hinged closures with built-in safety features for vacuum, low and high pressure service are described in this product bulletin. Photos illustrate features, charts give dimensional specifications and cross-section drawings show design details. Tube Turns Div., Chemetron Corp.

Here's how you can save money by

DEGREES

TRERICE SELF-OPERATING TEMPERATURE REGULATORS

cut your liquid processing costs by maintaining the *one best* temperature. Trerice No. 90000 and No. 90400 Self-Operating Temperature Regulators insure automatic, precision control of liquid temperatures between 40° F. and 300° F. No air or electricity required for operation. Available in either direct or reverse acting models; stainless steel or bronze trim. Most ranges and sizes in stock.



Write today for Bulletin No. 1000

Name .....

Address .....

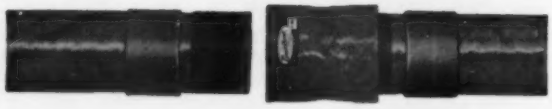
City ..... Zone ..... State .....

H.O. TRERICE CO. 1420-G W. Lafayette Blvd. Detroit 16, Michigan

For more facts circle 715 on Reply Card

BONDSTRAND®

fiber-glass reinforced epoxy pipe by Amercoat®



... strong as steel pipe, only one-eighth the weight. Tensile: hoop 80,000 psi, longitudinal 40,000. Highly corrosion resistant. Won't scale, cold flow or deform. 20-foot lengths easy to cut and join; threaded or locking wedge fittings.

MOST COMMON DIAMETERS AVAILABLE

Write for BONDSTRAND technical brochure

Amercoat® CORPORATION

Dept. LE • 4809 Firestone Boulevard South Gate, California

For more facts circle 716 on Reply Card

LOW COST HAND PUMPS

for safe, fast dispensing of INDUSTRIAL LIQUIDS

20 g.p.m. TRANSFER LUBE AND CUTTING OILS, SOLVENTS, FUELS AND PROCESS LIQUIDS WITHOUT WASTE

Double-action, 20 g.p.m., corrosion-resistant pump available in models for most plant needs. Complete catalog and prices available by return mail. Quick delivery from many warehousing points.

WRITE for CATALOG

ROTARY TYPE AVAILABLE IN MODELS USED AS

- BARREL PUMP
- HOSE REFUELER
- SKID TANK PUMP
- PIPESTAND UNIT
- PIPELINE MOUNT

10 g.p.m.

BOWSER, INC. FORT WAYNE INDIANA

1381 E. Creighton • Fort Wayne, Ind.

For more facts circle 717 on Reply Card

CUT PRODUCTION LINE CHANGEOVERS TO NEAR-ZERO AVERAGES!

TIME-SAVING: The ultimate in electrical connector design . . . exclusive coupling feature reduces time required to change or replace electrical equipment to minimum . . . eliminates costly rewiring and down time.

EFFICIENT: Power-to-equipment wiring becomes one-time job. Correct design reduces production losses caused by faulted feeders, motors, control equipment (1-pc. molded-to-cable construction, precision threaded shells, positive polarization, non-corrosive components).

SAFE: Vibration, pressure, and shatter proof; 100% moisture tight shrouded design; chemically safe and oil resistant. *Available* in 2, 3 and 4 conductor styles to 20 amps.; 600v. max.

Write for new illustrated Bulletin B68.

CD 1258.3

JOY ELECTRICAL PRODUCTS DIVISION

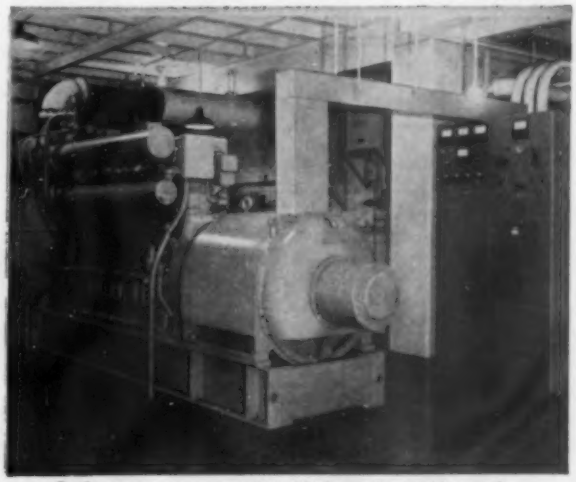
1211 Macklind Ave., St. Louis, Mo.

Exec. Offices, Henry W. Oliver Bldg. Pgh., Pa.

For more facts circle 718 on Reply Card

---

best reasons in the world why it's IDEAL*



Typical high speed unit with control.

*IDEAL high-speed generators and control equipment pictured above are typical of installations in hundreds of America's leading industrial plants, public utilities and commercial buildings. Custom-designed for longer life with proven efficiency and economy, IDEAL equipment is backed by over a half-century of creative electrical engineering and careful, conscientious workmanship. Unified responsibility for generating units and controls assures you of *better* products *better built* for dependable service with lower operating and maintenance costs. Why not check with IDEAL on your next power application problem?

Write for bulletin 505

The IDEAL ELECTRIC & MANUFACTURING CO.

327 East First St. Mansfield, Ohio

SINCE 1903, AMERICA'S FINEST MOTORS, GENERATORS, MOTOR-GENERATOR SETS, SWITCHGEAR AND CONTROLS

For more facts circle 719 on Reply Card

DATA FILE

(Begins on page 300)

479 **Product Directory**—Product Directory G-103 covers company's divisions and products. Products are divided into major sub-groups—chain link fence, chemicals and coke, springs, belts, wire, wire cloth, etc. Brand names are given, as well as applicable reference literature. The Colorado Fuel and Iron Corp.

480 **For Blast Cleaning**—Heavy-duty Rotoblast barrels are described in 16-pp Bulletin 705. Cutaway drawings and sketches show wheel construction, along with features of heavy-duty cleaning barrels. Capacities for each size of the five heavy-duty models are included. Also treated is the T-section extra-heavy work conveyor and the push button door. Case histories are presented to show how the units are saving money in installations. Pangborn Corp.

482 **Laminated Padlocks**—Eight-pp Catalog 70 describes features and advantages of company's laminated padlocks designed for greater strength, improved security. Various types of locks are illustrated and descriptive data given. Master Lock Co.

483 **All Steel Reels**—Featured in 40-pp Catalog C-2 is a line of all steel reels, including air hose reels, belt reels, communication reels, hand-operated reels, instrumentation reels, lifting cables and cords, motor driven reels, spring-operated reels, and accessory equipment. Includes application suggestions, motor current tables, stretching, lifting and retrieving capacities, dimensional data. Gleason Reel Corp.

485 **Industrial Equipment**—Featured in this 5-pp Bulletin is a line of equipment manufactured by this company, including such items as air release, can filters, capacitors, circulating lubrication systems, rate of flow controllers, dispensing outfits, filters, indicators, lubricating units, meters, oilers, pumps, valves, and other products. Applications stories are included. Bowser, Inc.

487 **Draft Starter**—Capacity data for Quickdraft units are presented in 8-pp Form QF-SD. Seven capacity tables provide means for determining capacity of standard units when installed under hundreds of different conditions. Quickdraft Co.

488 **Silicone Products**—The 1959 Reference Guide to company's silicone products tells which silicones can best meet the needs of a variety of problems ranging from adhesives to release agents, resins to rubbers, dielectrics to water repellents. Contains graphic examples of typical applications, selection data. Dow Corning Corp.

489 **Industrial Heat Exchanger**—This Selection Data Form covers a complete line of industrial heat exchangers, including a package regenerative air preheater designed for industrial process or boilers in a range from 25,000 to 250,000 lb per hr; recuperative type heat exchangers for high temperatures, high pressure applications where leakage cannot be tolerated; and a compact rotary regenerator. The Air Preheater Corp.

490 **Tube Fittings and Hose**—Comprehensive data on brass and steel tube fittings, tube working tools, hose, hose ends and assemblies most frequently used in hydraulic and pneumatic systems is presented in 16-pp Catalog C-301. Selection data included. The Weatherhead Co.

491 **Air, Hydraulic Equipment Upkeep**—"The ABC's on Maintenance of Air and Hydraulic Equipment," is a 24-pp cartoon-type booklet presenting the "rights" and "wrongs" in setting up and servicing air and hydraulic equipment. Major reasons for unsatisfactory performances and steps to prevent them outlined. Logansport Machine Co., Inc.

REPAIR FOR YOUR B&D TOOLS

Check the Yellow Pages under "Tools-Electric" for the location of the nearest Black & Decker factory service branch or authorized service station.

Free tool inspection when requested • Genuine B&D parts used • Factory-trained technicians • Standard B&D Guarantee at completion of recommended repairs • Fast service, reasonable cost, always.

Or write for address of nearest of more than 50 branches and service stations to: The Black & Decker Mfg. Co., Dept. 1805-S, Towson 4, Md.

Black & Decker

QUALITY TOOL SERVICE

For more facts circle 720 on Reply Card

PICK the RIGHT HANDLING TRUCK

This handy reference describes Lewis-Shepard's *complete* line of "manually-operated," "intermediate" and "all-electric" equipment. Here is everything you need for a fully-integrated materials handling system. Write today for your free copy of L-S Condensed Catalog 80-204.

L-S LEWIS-SHEPARD®

Walnut Street, Watertown 72, Mass.

For more facts circle 721 on Reply Card

BE CONFIDENT

FOR SPACE HEATING

CALL NATIONAL

Only National "Universal" heaters offer exclusive "total-design" heaters with custom built burners or conventional packaged burners. Choose from 6 models, 96 sizes—the largest selection in the industry to fit *every* heating requirement.

Before you select—*call* or *write* National. Be confident you make the *right* space heating decision.

Select with Confidence!

NATIONAL HEATER CO.
2475 Doswell Ave. • St. Paul, Minn.
Midway 6-9631

For more facts circle 722 on Reply Card

One of a series

Let's get clear on— WHAT ENGINEERS DO

Simply stated, engineers apply the sciences to give people use of nature's materials, forces.

Scientists make it known. Engineers make it useful.

Scientists split the atom; engineers design and build the atomic power plants.

All science known would benefit nobody if not applied by engineers to manufacturing, construction, mining, agriculture or the generation of power.

These are the great engineered industries—all based on scientific knowledge.

Engineers plan, design, produce, maintain and *operate.* To repeat: *Scientists make it known. Engineers make it useful.*

ENGINEERS JOINT COUNCIL

Engineers Joint Council
29 West 39th St., N. Y. 18, N. Y.
For information call Pennsylvania 6-9220

YOU PAY NOTHING

if OSPHO*—applied on rusted metal does not . . .

1. KILL THE RUST

2. STOP FURTHER RUST ACTION

3. PROVIDE A SOUND BASE FOR PAINT

Brush off loose rust. Apply OSPHO right over remaining rust. Water-thin, OSPHO soaks through the rust, flows into hard-to-reach spots. One application kills *all* the rust . . . stops further rust action. Let dry, then apply regular maintenance paint. OSPHO makes paint jobs last much longer.

OSPHO is *not* a primer, *not* a paint. It is a phosphoric treatment. Brushed or sprayed on rusted metal, it changes rust (iron oxide) into iron phosphate—an inert, hard surface ideal for painting. OSPHO also insures tight adhesion of paint on new metal—including aluminum and galvanized.

Colorless, non-toxic, non-flammable, OSPHO gives excellent coverage—a gallon treats up to 600 sq. ft. Repeat orders from industry over 12 years prove its worth.

Use the coupon to order 5 gallons. Try OSPHO. If it does not do all we claim for it, *we'll cancel the invoice.*

RUSTICIDE PRODUCTS CO.
3127 Perkins Avenue • Cleveland 14, Ohio

Ship us 5-gal. pail of OSPHO @ $3.40 per gal. (F.O.B. Cleveland). If it does not do what you say, we'll notify you within 30 days of receipt, and you will cancel the invoice.

Name_____ Title_____

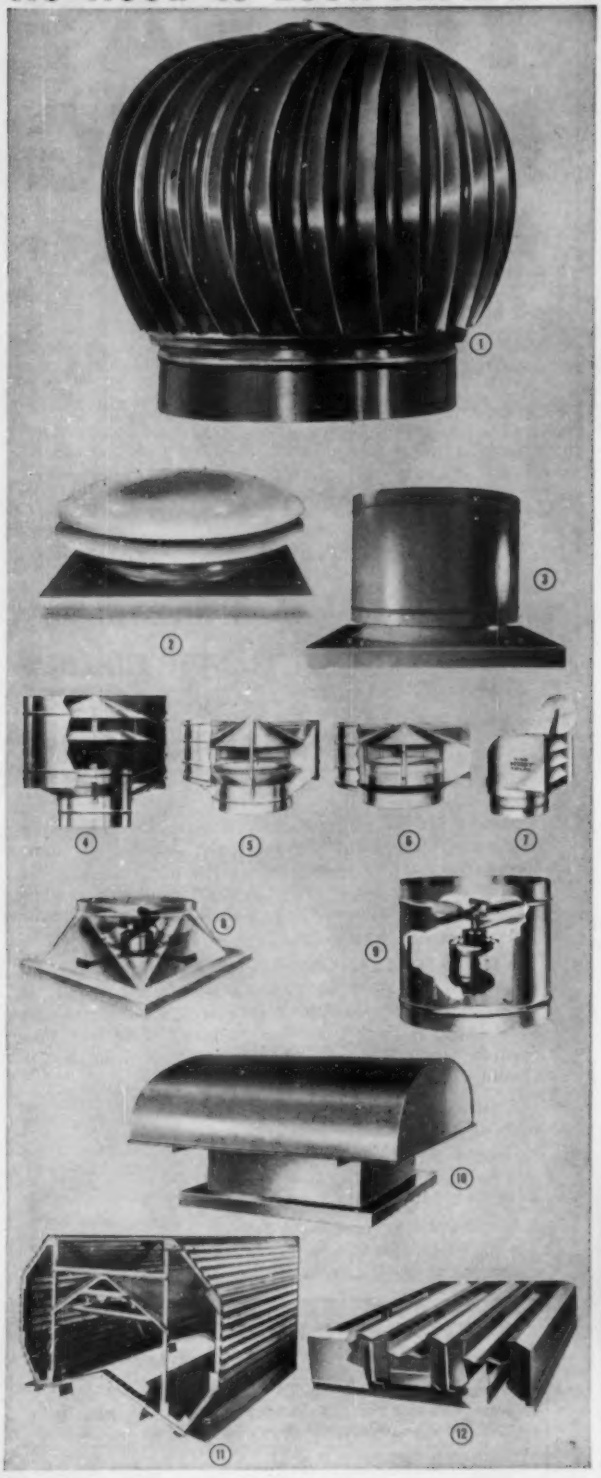
Company_____

Address_____

City_____ Zone_____ State_____

For more facts circle 724 on Reply Card

No Need to Look Further...



Write today for nearest representative

WESTERN ENGINEERING AND MFG. CO.

P.O. Box 66455
Los Angeles 66, California

Complete Catalog in Sweets. Member Air Moving and Conditioning Assoc., Inc.

For more facts circle 725 on Reply Card

VERTICAL TURBINE PUMPS

FLOWAY
formerly SMITHway

Fit The Market

FloWay pumps are serving every industrial pumping need, serving well because they are designed and constructed for specific requirements. Whether the liquid is in the extremes of heat or cold, corrosive or non-corrosive, volatile or non-volatile, there is a FloWay pump ideally suited. Send for Bulletin #14 which describes the full line of FloWay Vertical pumps.

FLOWAY Pumps

MANUFACTURED BY
FIESE & FIRSTENBERGER MFG., Inc.
2494 Railroad Ave. Fresno, Calif.

Contact your FloWay distributor

Oakland, California
Pacific Pumping Company
San Francisco, California
Woodin & Little
Denver, Colorado
Harry J. Glass & Associates
Oakland Park, Florida
Peninsular Armature Works
Metarie, Louisiana
A. G. Kirkwood Co.
Baltimore, Maryland
R. Thum & Company
Buffalo, New York
Ralph Simmons & Company
New York, New York
Frank A. Kristal
Cleveland, Ohio
W. J. Bryson Company
Tulsa, Oklahoma
The Kase Company
Portland, Oregon
Pacific Pumping Company
Ardmore, Pennsylvania
Weinman Pump Manufacturing Co.
Pittsburgh, Pennsylvania
Weinman Pump & Supply Co.
Houston, Texas
Pump & Power Engineering Co.
Dallas, Texas
Livingston Machinery Co.
Seattle, Washington
Pacific Pumping Company

For more facts circle 726 on Reply Card

ADVERTISERS IN THIS ISSUE

When writing to advertisers please tell them you saw their ad in Plant Engineering—or send us the number directly below ad—use the post card in "Bulletin Insert."

Aerovent Fan Co., The 258
Air Preheater Corp. 171
Alan Wood Steel Co. 285
Alim Corporation 315
Aluminum Company of America 192-193, 239
Amercoat Corporation 322
American Bridge Division 180-181
American Chain & Cable Co.
Wright Hoist Division 71
American Engineering Co. 200
American Hoist & Derrick Co. 263
American Machine & Metals, Inc. 257
American Standard Industrial Div. ..... 77 thru 80
Anderson Co., V. D. 260
Armstrong Bros. Tool Co. 318
Armstrong Machine Works 227

Ballymore Company 274
Bassick Company 6
Bay Products, Inc. 319
Black & Decker Mfg. Co. 89-90, 324
Blaw-Knox Company 252
Boiler Engr. & Supply Co. 244
Bowser, Inc. 323
Brook Motor Corporation 284
Brown Boveri Corporation 305
Buffalo Forge Company 197
Bulldog Electric Products Div.
ITE Circuit Breaker Co. 169
Bussmann Mfg. Company 62-63
Butler Mfg. Company 106-107

C & D Batteries, Inc. 110
Campbell Chain Company 241
Calcote Company 236
Celanese Corp. of America 207
Chemical & Power Products, Inc. 34
Chemtrol 248
Chiksan Company 293
Clarage Fan Company 220
Clayton Mfg. Company 73
Cleaver-Brooks Company 276
Cleveland Tramrail Division
Cleveland Crane & Engr. Co. 86
Colorado Fuel & Iron Corp. 271
Columbus McKinnon Chain Corp. 238, 309
Combustion Engineering, Inc. 261
Conco Engineering Works 312
Connor Engineering Corp. 70
Corning Glass Works 286
Crouse-Hinds Company 45
Cutler-Hammer, Inc. ..... Back Cover

Darnell Corporation, Ltd. 321
Day Company 50
De Bothezat Fan Div.
American Machine & Metals, Inc. 257
DeLaval Steam Turbine Co. 174-175
Deluxe Metal Products Co. 76
Dollinger Corporation 61
Douglas Fir Plywood Assn. 301
Dow Corning Corp. 209-210
Dracco Div. of Fuller Co. 212
Dravo Corporation 264
Duff-Norton Company 268
Du Pont de Nemours & Co., E. I. 267
Duriron Company 237

Electric Storage Battery Co. 188-189
Equipto 279
Erie City Iron Works 12-13
Esso Standard,
Div. of Humble Oil & Refining Co. 235

Falk Corporation 303
Federal Sign & Signal Corp. 319
Feedrail Corporation 274
Fiese & Firstenberger 326
Flintkote Company 96, 320
Fluor Products Company 255
Fuller Company 48

Gai-Tronics Corporation 36
Gardner-Denver Co. 52
Garlock, Inc. 204-206
Gates Rubber Company 47, 87
Gedney Electric Co. 269
General Electric Company
Apparatus Division ..... 17 thru 20, 32-33, 84-85, 177, 249-250, 253
Circuit Protective Devices 283
Lamp Division 69
Wiring Devices Dept. 317
General Precision Laboratories, Inc. 256
Gleason Reel Corp. 304
Globe Company
Products Division 72
Goodyear Tire & Rubber Co., Inc. 1
Gould-National Batteries, Inc. 98
Graybar Electric Company 3
Greene, Tweed & Co. 306
Grinnell Company 57
Gulf Oil Corporation 102-103
Gustin-Bacon Mfg. Co. 222-223
Guth Co., Edwin F. 225

Hall Laboratories, Inc. 24
Hansen Mfg. Company 290
Harnischfeger Corp. 277-278
Harry Glass Co., H. A. 251
Hartzell Propeller Fan Co. 328
Hooker Chemical Corp. 53

Ideal Electric & Mfg. Co. 323
Ideal Industries, Inc. 264
Industrial Combustion, Inc. 319
Ingersoll-Rand Company 21
Inland Steel Company 60
Iron Fireman Mfg. Co. 101
ITE Circuit Breaker Co. 56, 206

Jenkins Bros. 51
Jenn-Air Products Co. 30-31
Johns-Manville Corp. 74-75, 186, 194-195
Joy Manufacturing Company 27, 323

Killark Electric Mfg. Co. 22-23
Kirk & Blum Mfg. Co. 68
Koelling Universal Joints, Inc. 320

Le Roi Division
Westinghouse Air Brake Co. 281
Leslie Company 184-185
Lewis-Shepard Products, Inc. 324
Link-Belt Company 201, 247
Liquidometer Corporation 48
Logansport Machine Co., Inc. 287
Louis-Allis Company 54-55
Lyon Metal Products, Inc. 211

MacWhyte Company 217
Mahon Company, The R. C. 224
Manning, Maxwell & Moore, Inc. 214
Master Lock Company 266
Micro Switch
Div. of Minneapolis-Honeywell 82-83
Mine & Smelter Supply Co. 270
Mississippi Glass Company 99-100
Mobil Oil Company 198-199

Nagle Pumps, Inc. 306
National Electric Division
H. K. Porter Co., Inc. 240
National Heater Co. 325
New England Carbide Tool Co. 280
New York Blower Co. 272
Niagara Blower Company 288
Norgren Company, C. A. 35

Oakite Products, Inc. 317
Orr & Sembower, Inc. 299
Otis Elevator Company 42-43

Page Fence Association 270
Pangborn Corporation 14-15
Partlow Corporation 38-39
Pass & Seymour, Inc. 262
Peerless Electric Div.
H. K. Porter Co., Inc. 246
Pittsburgh Coke & Chemical Co. 245
Pittsburgh Plate Glass Co. 275
Porter, Inc., H. K. 280
Porter Co., Inc., H. K.
National Electric Div. 240
Peerless Electric Div. 246
Porter-Cable Machine Co. 242-243
Powers Regulator Company 67
Propellair Div.
Robbins & Myers, Inc. 315

Quickdraft Corp. 308

Radiant Lamp Corp. 254
Resolite Corporation 226
Reynolds Metals Company 5, 88
Ridge Tool Company 310-311
RLM Standards Institute, Inc. 291
Robbins & Myers, Inc.
Hoist & Crane Div. 29
Pump Division 28
Rockwell Company, W. S. 282
Rohm & Haas Company 11
Rome Cable Corporation 166-167
Rusticide Products Co. 325
Rust-Oleum Corporation 173
Ryerson & Sons, Inc., Joseph T. 65

Sarco Company, Inc. 232-233
Schramm, Inc. 321
Sexauer Mfg. Co., J. A. 282
SKF Industries 37
Smith & Co., Inc., Elwin G. 219
Square D Company ..... 2nd Cover, 41, 3rd Cover
Standard Dry Wall Products, Inc. 81
Standard Electric Time Co. 228
Standard Oil Co. (Indiana) 49
Standard Pressed Steel Co. 213
Steelcote Mfg. Company 316
Stromberg-Carlson Co. 273
Strong, Carlisle & Hammond 16
Sumo Pumps, Inc. 292
Sun Oil Company 229

Tennant Co., G. H. 234
Texaco, Inc. 97
Thomas Flexible Coupling Co. 4
Trerice Company, H. D. 322
Truscon Laboratories 259
Tube Turns Div. of Chemetron Corp. 108-109
Tube Turns Plastics, Inc. 292

Union Wire Rope Corp. 289

Viking Pump Company 304

Weatherhead Company 179
West Chemical Products, Inc. 284, 288, 318
Western Engr. & Mfg. Co. 326
Westinghouse Electric Corp. ..... 7 thru 10, 93 thru 95, 104-105, 182-183, 187, 190-191, 202-203, 208, 215, 294
Wheeler Mfg. Co., C. H. 314
Wickwire Spencer Steel Div. of CF&I 271
Wiegand Company Edwin L. 196
Wilkerson Corporation 266
Wright Hoist Division
American Chain & Cable Co. 71

Yale & Towne Mfg. Co. 58-59
Yarnall-Waring Company 265

Zenith Electric Co. 321

why buy 5 fans when 1 will do the job?

When you've got a big air moving job to do, use a big fan to do it. Hartzell Low-Speed, High-Volume Fans will handle your big air moving jobs with amazing economy because one of these big fans will do the work of several smaller units.

For example, one 94", 25 H.P. Hartzell Low-Speed, High-Volume Fan will move 174,000 C.F.M. at free air or 157,000 C.F.M. against ¼" static pressure. That's a lot of air . . . but if it's not enough Hartzell can supply fans in diameters up to 22'. These include all-aluminum assemblies in diameters to 144", glass-plastic fans in 8' and 10' diameters and fabric-base Hartzite plastic fans in sizes from 10' to 22'.

And all of these heavy-duty Hartzell fans are as maintenance-free as fans can be because they're designed and built to stand up under the most demanding industrial applications . . . and thousands of installations prove that they have what it takes.

If you have a big air moving problem . . . or any other problem in industrial ventilation . . . it will pay you to get acquainted with your nearby Hartzell field engineer. Drop us a line for his name and address or check the complete list of Hartzell field offices in our catalog in Sweet's Industrial Construction or Plant Engineering Files.

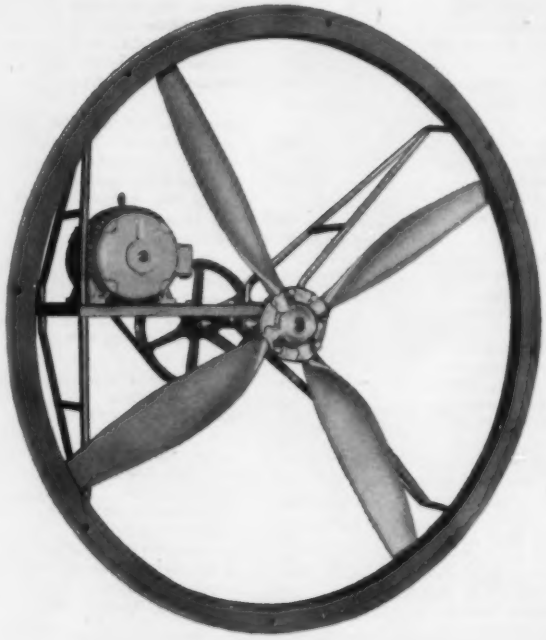


Photo above shows standard construction of Hartzell Low-Noise, High-Volume Fans in sizes from 65" to 94". These fans can also be furnished in direct-connected or pulley-drive (less motor) construction or in belt-drive models with the motor mounted outside the air stream.

here's a complete line of air moving equipment designed and built specifically for industry

Other famous Hartzell products include controllable and full feathering propellers for light aircraft, crop drying equipment and farm ventilating fans.

HARTZELL PROPELLER FAN COMPANY • 51 Thomas Blvd. Piqua, Ohio
Div. of Castle Hills Corp. A Member of AMCA Engineering Offices in Principal Cities

For more facts circle 727 on Reply Card

Square D TOTALLY ENCLOSED Duct*

takes less space—*and costs no more*

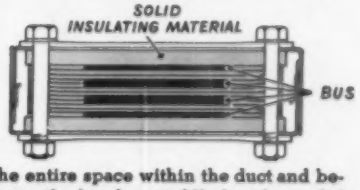
*(low impedance)

Ventilated bus duct is bulky and awkward. It's difficult—sometimes impossible—to install it in restricted areas. The layers of insulation around the bus bars and the necessary air spaces contribute to large, inconvenient size.

Square D totally enclosed feed-in duct solves the space problem. Solid sheets of insulation permit mounting bus bars only ¼" apart. This solid insulating material is also an effective heat conductor, thus eliminating the need for air spaces. The result—Square D low-impedance duct is as much as 50% smaller than ordinary duct. It can be used where no other duct fits. It makes expansion of existing electrical systems easier, new construction planning simpler. Best of all, Square D low-impedance bus duct is totally enclosed. Having no ventilation holes, it's safe from physical damage and dust accumulation. Needing no ventilation, it can be mounted in any position without de-rating.

Doesn't it make sense, when buying feed-in duct, to specify a product that will meet all your requirements? Square D totally enclosed low-impedance duct costs no more—why settle for less?

Here's Why Square D's EXCLUSIVE Design makes ventilation unnecessary



The entire space within the duct and between the bus bars is filled with a solid insulating material which conducts the heat to the surface. There are no dead air spaces inside the duct. Square D totally enclosed low-impedance duct is listed with Underwriters' Laboratories and meets U/L requirements for temperature rise in any mounting position.

SQUARE D COMPANY

wherever electricity is distributed and controlled

For more facts circle 728 on Reply Card

Look what's behind Cutler-Hammer's new trademark

You can see the new power at Cutler-Hammer wherever you look. New products. New engineering depth, particularly in industrial automation. New plants and streamlined marketing methods, too. Even a new trademark to reflect this new vitality.

If you're planning ahead for the great growth of the sixties, come to the company that's ready to plan ahead with you. Look at just a few of the new products that are already improving efficiency in many fields:

NEW computer system for establishing quality of tinplate coils

NEW limit switch that outlasts others by at least two times

NEW automated system for charging blast furnaces in steel mills

NEW stacker that counts and stacks newspapers automatically

NEW Safetybreaker line of service entrance equipment

WHAT'S NEW? ASK...

CUTLER-HAMMER

CONTROL

Cutler-Hammer Inc., Milwaukee, Wis. • Division: Airborne Instruments Laboratory • Subsidiary: Cutler-Hammer International, C. A. Associates: Canadian Cutler-Hammer, Ltd.; Cutler-Hammer Mexicana, S. A.; Intercontinental Electronics Corporation.

For more facts circle 729 on Reply Card